montana environmental sciences

Volume 2, 1979

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COVER PHOTOS — Once common in lumber-producing communities throughout Montana, teepee burners, such as the one on the front cover, are not often seen these days. Their propensity to send billowing clouds of smoke into the air and the wood industry's ability to more thoroughly use wood wastes are marking an end to the use of these metal infernos. While in Philipsburg several years ago, Dave Maughan, Air Quality Bureau, used infrared film to photograph the teepee burner on the front cover in full blast. In contrast to the fiery front cover, the back cover shows a resident of the Prickly Pear Creek community taking a morning stroll early last fall. The small milkweed bug *(Lygaeus kalmi)* was photographed by Tom Ellerhoff before it ducked back into the milkweed pod.

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ISSUES

The catchword these days is "cost effective." This can be a hard and cynical phrase denoting efficiency, or it can mean well-thought-out plans and conclusions. The more dispassionate interpretation lacks the mellowing influence of compassion and human concerns that cannot be measured by mere money.

Economic laws talk in terms of realizing a return on an investment, but there are also social laws which must be given equal weight, or perhaps even greater weight than those based on financial returns on an investment. Social law springs primarily from the moral sense of the community, and in a democracy, where the will of the people is sovereign, social law is successful only when the community is in sympathy with it.

future choices

If our sympathies have deteriorated to the point where all things are measured in terms of money, then we must reexamine our expectations for the future, because we are saying that in some instances, it may simply be too costly to keep people alive. Their health, welfare and, indeed, their very lives will be bartered and purchased like a refrigerator or secondhand car.

The worth of maintaining quality air, water and living conditions is difficult, if not impossible, to measure in terms of dollars and cents.

A favorite scapegoat of the cost effective philosophy is the cost of obtaining and maintaining a clean environment. Yet, if all pollution control measures were abandoned today, it is doubtful—no, certain—that prices would not be lower or inflation suddenly diminished or done away, and we would wind up permanently losing valuable resources. Many people are angered by those who continually equate pollution control with loss of wealth.

There is still time for us to create and sustain a healthful standard of living for ourselves and future generations, but we must be willing to accept the personal discipline necessary to preserve it and restrain those forces that would degrade it for personal gain.

Men and women of vision are needed to actively engage in whatever fight may be necessary to preserve Montana's clean air and water and bountiful land against the unending pressures to sacrifice them for short-term profits.

Economic vitality and a healthy environment go hand-in-hand. If the moral sense of the community does not accept this, then we must inevitably lose vitality and health to profits-at-any-cost efficiency.

—Ben Wake

ANSWERS

Searching For Clues To Butte's Radiation Puzzle

by Daryl Mercer

photograph courtesy of the MONTANA HISTORICAL SOCIETY

Late in 1977 the Occupational Health Bureau, Department of Health and Environmental Sciences (DHES), discovered elevated levels of radiation present in the Butte area. Since then a comprehensive study has been initiated to determine the population's exposure to radiation. Preliminary studies indicate above normal radiation levels are the result of several contributing factors:

(1) Granite bedrock and alluvium in the Butte basin show elevated radiation levels. This indicates the granite is relatively high in the naturally occurring radioactivity. Granite blocks which emit elevated levels of radiation have been quarried and used in the construction of many homes and other structures.

(2) Phosphate slag, containing elevated levels of radium-226, has been, and is still being used extensively as an aggregate (gravel or crushed rock) for the paving and graveling of streets, roads, highways, parking areas, etc., in and around Butte.

(3) In the late 1950's phosphate slag was used to make prestressed concrete beams, slabs and concrete blocks which were used to build homes, public buildings, highway bridges, patios, fences, etc.

(4) The slag from some of the old smelters in the Butte area shows elevated levels of radioactivity. Some slag from these dumps has also been used as an aggregate for concrete. Also, some of this slag was formed into blocks and used in home construction.

(5) Preliminary indications are that the large slag dumps from smelter operations in the Anaconda area contain elevated levels of radioactivity.

The health risk associated with exposure to increased levels of radon and its decay products is difficult to assess; however, epidemiological studies of uranium miners who were exposed to elevated levels of radon daughters show there is an associated increase in the incidence of lung cancer.

THE OCCUPATIONAL HEALTH BUREAU is trying to determine what effect these materials containing higher-than-normal levels of radioactivity have on radiation exposure to people living in the Butte and Anaconda areas. Of particular interest is the presence of radium-226 and its decay products. When radium-226 decays, it forms an inert radioactive gas, radon-222. Radon-222 has the ability to seep from the ground, slag piles, building materials, paving, etc., into the atmosphere and inside buildings. The radon-222 subsequently decays into a series of radioactive elements called radon daughters. When inhaled, these radon daughters can give high radiation doses to the lungs.

continued

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Figure 1, reproduced from a 1975 report of the U.S. Environmental Protection Agency (EPA), shows the estimated lung cancer risks associated with various radon daughter levels and exposure periods. For example, continuous exposure to a concentration of 0.2 Working Levels (WL) for 11 years may increase the normal risk of lung cancer by a factor of two.

THE UNITED STATES SURGEON GENERAL has released the following guidelines for radon daughter concentrations inside homes:

Level	Recommendation
Greater than 0.05 WL	Remedial action indicated
From 0.01 to 0.05 WL	Remedial action may be suggested
Less than 0.01 WL	No action indicated

To date, the Occupational Health Bureau's primary emphasis has been to investigate the use of the phosphate slag in building materials. During 1957 and 1958 a company named Montana Concrete Industries, Inc., was situated near Ramsay and the Stauffer Chemical Company plant. This firm used phosphate slag as an aggregate in manufacturing concrete building materials.

Since the bureau lacked many of the instruments necessary to locate and evaluate structures containing the phosphate slag, assistance was requested from the EPA. The EPA responded by sending a radiation scanner van and two operators from Las Vegas, Nevada, from April 12 to April 16, 1978. The van contained sensitive radiation detection equipment and was used to measure background (existing environmental conditions) and street radiation levels and to identify areas with above normal radiation levels. Approximately 750 areas of above normal radiation levels were identified in Butte. These areas are being investigated and are resulting in identification of many structures containing phosphate slag building materials.

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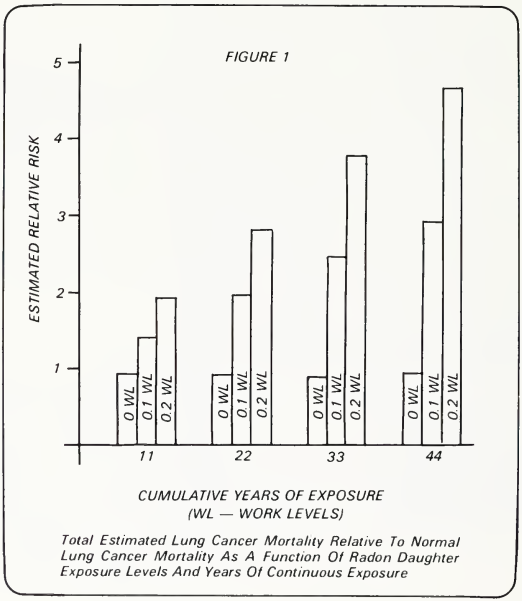
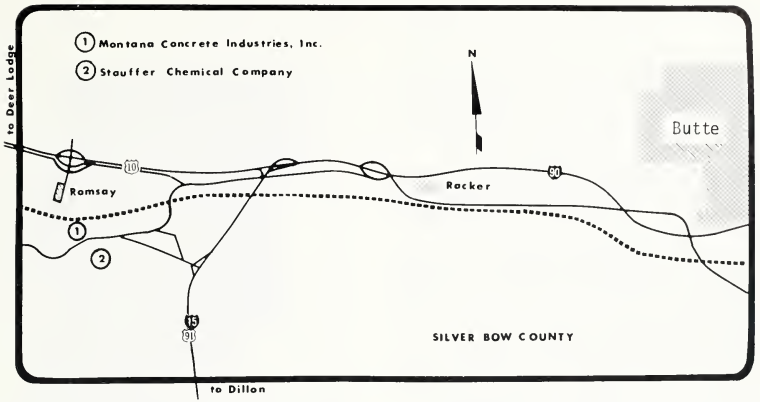


Total Estimated Lung Cancer Mortality Relative To Normal Lung Cancer Mortality As A Function Of Radon Daughter Exposure Levels And Years Of Continuous Exposure



THE EPA also loaned Montana instruments to measure radon daughter concentrations inside homes. These instruments are called Radon Indoor Progeny Integrating Sampling Units (RIPISUs). Air in the home is pumped through a radiation detector continuously for a period of up to one week. The detector is then sent to EPA laboratories in Las Vegas for analysis.

The initial data obtained from the RIPISUs convinced the Occupational Health Bureau that using phosphate slag in building materials poses a potential health risk to residents of these structures and that further investigation was warranted.

Another concern of DHES is the increase in the levels of gamma radiation in the Butte area. This hazard is probably less than that resulting from inhalation of the radon daughters. However, the conservative approach is to assume the risk is significant and should be taken into account during the evaluation of the health risk posed by the use of phosphate slag.

In late May, 1978, a reporter from the Butte newspaper, *Montana Standard,* discovered a partial set of invoices from Montana Concrete Industries, Inc., and turned them over to the DHES. These invoices led to discovery of many buildings containing the phosphate slag. The invoices also showed the use of the phosphate slag was much more widespread than previously supposed and that shipments had been made to communities outside of Butte, such as Anaconda, Philipsburg, Deer Lodge, Helena, Dillon, etc.

Preliminary findings indicated a thorough investigation of all sources of radiation and the associated health risks should be launched in the Butte area. The findings and a recommendation from the DHES for such a study were presented to the governor's office.

GOVERNOR THOMAS JUDGE expressed concern regarding the health risks associated with increased radiation levels in the Butte area and helped to provide the funding and commitments necessary to conduct the proposed investigation.

The Stauffer Chemical Company was informed of the early findings and of the proposed investigation and, in June, 1978, issued a voluntary moratorium on further sales of the phosphate slag. The company also provided DHES with a list of phosphate slag customers during the last four years.

Through the use of the EPA scanner van data, the Montana Concrete Industries invoices and personal inquiries, approximately 110 homes in Butte, Anaconda and Warm Springs have been found to contain phosphate slag incorporated into their building materials. Additionally, more than 50 locations have been identified where the building materials containing the slag were used outside the home, e.g., garages, fences, patios. Also, copper slag blocks have been found in four homes and granite blocks in 33 homes. Work is still continuing to find slag-containing structures in Butte and Anaconda, and as soon as possible the search will be expanded to other communities where materials containing slag are known to have been used.

As of December 1, 1978, about 180 measurements of radon daughter concentrations have been made using the RIPISUs in more than 75 locations.

RIPISU sample results to date show the following:

Concentration of Indoor Radon Daughters	Number of Samples
Greater than 0.05 Working Levels	6
From 0.01 to 0.05 Working Levels	61
Less than 0.01 Working Levels	65

CONCLUSIONS cannot be drawn from the present information because most of the samples were taken during the summer and early fall. Risk factors and safety guidelines are based on average concentrations. The bureau believes the concentrations will fluctuate considerably from season to season, with a probable increase during late fall, winter and early spring. Higher concentrations of radon daughters are expected during

continued

the cold months because ventilation in homes decreases. Also, large scale inversions occur in the Butte area which tend to restrict air movement, permitting atmospheric radon concentrations to build. Preliminary results from samples taken in early October support the idea that the concentrations will increase during cold months. The bureau feels that at least four measurements at about three-month intervals are necessary to determine average radon concentrations.

Information has also been obtained through the use of a direct reading radon monitor. This monitor continually measures the concentration of radon in the atmosphere and can be used to watch fluctuations in the radon levels.

Soil samples, water samples, and samples of various slag and tailings piles have been collected and are awaiting laboratory analysis. These analyses will help assess the levels of natural radioactivity in the Butte and Anaconda areas.

While early efforts were primarily directed toward measurement of radon daughter concentrations, an extensive effort is now being made to measure gamma ray levels in the Butte vicinity. The instrument being used for these measurements is a Pressurized Ionization Chamber (PIC). Plans include the measurement of radiation levels in streets, alleys, areas between streets and also inside selected buildings.

With the continued cooperation and assistance from industry, local, state and federal governments and the people in the Butte, Anaconda and other affected areas, this effort should be brought to a satisfactory conclusion by early 1980.

Considerable information must be gathered and analyzed to complete the radiation study. More information is needed to:

(1) Determine radon and gamma radiation background levels.
(2) Determine the contributions of slag and other materials to the radon and gamma levels.

After the DHES acquires sufficient data it will:

(1) Determine health risks associated with utilization of phosphate slag in construction materials.
(2) Determine if there are acceptable uses of phosphate slag.
(3) Attempt to find methods that homeowners can use to lower radon concentrations in homes measuring above recommended levels.

With the continued cooperation and assistance from industry, local, state and federal governments and the people in the Butte, Anaconda and other affected areas, this effort should be brought to a satisfactory conclusion by early 1980.

Clean Air Deadlines Amended

by Jerry Schneider

Cleaning up polluted air in Montana began in the mid-1960s. Working independently, the state was joined by the federal government when Congress passed the 1970 Clean Air Act Amendments.

At that time a wave of enthusiasm led people to believe the process could be accomplished by 1975, and no later than 1977. It didn't happen.

By the mid- 1970 s it was discovered that revisions needed to be made. The result was the 1977 Clean Air Act Amendments.

These new amendments contained many new and expanded requirements. One of the requirements was particularly significant; it directed states to submit, to the federal supervising agency (the Environmental Protection Agency (EPA)), current information concerning air quality in control regions and whether those regions (or areas in those regions) met the National Ambient Air Quality Standards (NAAQS).

The NAAQS apply to ambient air, or the air outdoors. Within the scope of these standards, the EPA created primary standards, air quality levels judged to be necessary to protect public health with an adequate margin of safety, and secondary standards, designed to protect the public from any adverse effects of a pollutant.

Requirements

To fulfill the 1970 EPA requirements, Montana and the other states had to submit a State Implementation Plan (SIP) to the federal agency. Essentially the SIP consists of identifying areas with air quality problems, analyzing the degree of pollution and developing plans to bring the areas into compliance with national air quality standards, and maintain compliance in areas meeting standards.

Due to the new clean air act amendments, all of the implementation plans must be revised. These revisions are to be submitted by the first of the year, with the EPA scheduled to approve the revisions by the first of July, 1979. The new deadline for attaining the primary national air quality standards is December 31, 1982.

The act provides for five air quality classifications. The classifications are:

1) Areas that do not meet a national primary ambient air quality standard for oxidants, carbon monoxide (CO), or nitrogen dioxide (NO^2).

2) Areas that do not meet, or in the judgment of the state, will not attain in the time required by the applicable SIP, any primary standard for particulate matter (PM) or sulfur dioxide (SO^2).

3) Areas that do not meet secondary standards.

4) Areas that cannot be classified as (1) or (2) on the basis of available information for PM or SO^2.

5) Areas that have better ambient air quality levels than national primary or secondary ambient air quality standards for oxidants, CO or NO^2 or for which there are insufficient data to be classified (1) or (3).

Area Designations

Areas designated as 1, 2 or 3 are referred to as nonattainment areas, and those designated as 4 or 5 are referred to as attainment (or classified) areas.

The Air Quality Bureau (AQB), Department of Health and Environmental Sciences (DHES), is preparing the SIP revision for Montana. In order to classify air quality throughout the state, the bureau used information gathered over two 12-month (eight quarter) periods. Although the new Clean Air Act Amendments required classifications to be made by the date the act went into effect, August 7, 1977, the AQB decided to use data through September 1977, which completed the third quarter of the year.

PSD is divided into three classifications: Class I permits very small increases in pollution; Class II allows somewhat larger increases, and Class III allows the air quality to "deteriorate" considerably more.

After reviewing the information, the bureau made the following proposals to EPA:

---The entire state was declared unclassified for oxidants. The information for the Colstrip area was intermittent and thereby of questionable validity, and Billings data showed attainment. The EPA designated Yellowstone County as nonattainment for oxidants.

---For NO^2, Billings and Colstrip were designated attainment areas, but the rest of the state was given an unclassified designation.

---Missoula and downtown Billings received nonattainment designations for CO, while the rest of the state was unclassified.

---Laurel, Anaconda and East Helena were classified nonattainment areas for primary SO^2 standards. The rest of the state was unclassified, though Billings has been predicted through computer modeling to have SO^2 problems.

---Five areas in Montana (downtown Billings, the Great Falls central business district, Butte, East Helena and Missoula) have been designated non-

continued

attainment areas for secondary PM standards, while three areas (Colstrip, Columbia Falls and Missoula) have been designated nonattainment for primary PM standards.

---Other areas in the state show PM violations, but since they were attributed to uncontaminated dust from non-industrial sources (unpaved roads, agriculture, etc.), they received unclassified designations as did the remainder of the state.

The new legislation encourages local governments to be responsible for implementing the planning, but if this does not occur, the responsibility can be given to a state agency, which in Montana would be the Air Quality Bureau.

Redesignation

All of the unclassified or attainment areas may be subject to redesignation should future data show violations of NAAQS.

If an area is designated as attainment, the applicable implementation plan must include prevention of significant deterioration (PSD) requirements.

According to PSD regulations, all major pollution emitting facilities (those with emissions of more than 100 tons a year) are subject to a preconstruction review. This review is to determine how much additional pollution will be added to the ambient air by the new source.

PSD is divided into three classifications: Class I permits very small increases in pollution; Class II allows somewhat larger increases, and Class III allows the air quality to "deteriorate" considerably more.

In general, Class I is designed for "pristine" areas where almost any deterioration would be significant. Class I areas include international parks, wilderness areas larger than 5,000 acres, national memorial parks larger than 5,000 acres and existing national parks larger than 6,000 acres. All other areas of the country classified as attainment are Class II. Class II limits allow for moderate, well-controlled growth and Class III allows pollutant levels to increase considerably.

Provisions

The PSD provisions mandate an extensive preconstruction review, restrictive emission limits, additional monitoring requirements and the realization of a balance between growth and air quality considerations.

The requirements for a nonattainment area plan depends on the pollutant. For PM (or total suspended particulate (TSP)) or SO^2, requirements are primarily directed at stationary sources, such as industrial stacks, waste incinerators, etc.; for CO, NO^2 or oxidants the requirements are directed at mobile sources, such as motor vehicles.

After the EPA approves the revised SIPs July 1, nonattainment area plans must include: the installation of all "reasonably available" control measures as soon as possible; annual incremental reduction of emissions; indications of public and local and state government involvement, and a restrictive permit program.

The permit program is to provide for annual incremental reductions in emissions, ensure new or modified sources comply with stringent emission limitations and provide that all new or modified sources are in compliance or on a compliance schedule with applicable emission limitations.

In terms of the nonattainment plan's goal of achieving the primary NAAQS by December 31, 1982, there will be no extensions for TSP or SO^2. However, it is possible for the EPA to grant an extension for CO and oxidants to December 31, 1987. The extension can be granted if compliance cannot be attained by 1982 even with application of all reasonably available control measures.

If it is proven an extension should be granted, the plan must contain three additional elements: First, a program for analyzing proposed new major sources; second, information indicating that benefits of the proposed new source outweigh the social and environmental costs, and third, a plan to show that vehicle emission control would be in compliance by the December 31, 1987 deadline.

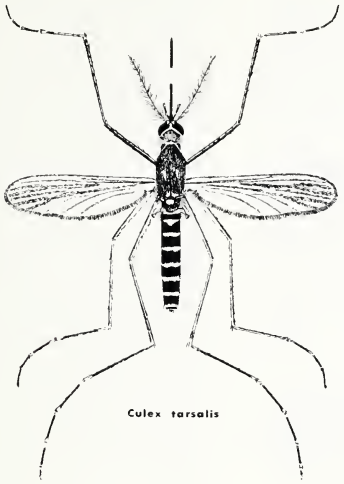
New Legislation

The new legislation encourages local governments to be responsible for implementing the planning, but if this does not occur, the responsibility can be given to a state agency, which in Montana would be the Air Quality Bureau.

Even though the act authorizes the appropriation of $75 million for full federal funding of the first two years, only some of this money has been made available.

The PSD provisions mandate an extensive preconstruction review, restrictive emission limits, additional monitoring requirements and the realization of a balance between growth and air quality considerations.

In addition to appropriating little money for the planning, Congress imposed certain economic sanctions. For example, the Secretary of Transportation is not to approve any projects or award any grants for transportation control projects in a nonattainment area if the state has not submitted a suitable implementation plan by July 1979 (or July 1, 1982 if an extension is obtained). Safety, mass transit and transportation improvement projects can be approved if they are related to improving air quality.



Biological Weapons Prove Safe and Effective Against Montana Mosquitoes

by Van Jamison

Few Montanans spend a summer without listening to a serenade of faint, whining hums; slapping at exposed skin or scratching red, raised welts. Retreats to golf courses, parks and other outdoor recreation areas during the warmer months often become unbearable when mosquitoes are active. Annually, reluctant Montanans are recruited to donate their blood to these tiny tormentors.

Clouds of pestiferous mosquitoes have a more significant impact on Montanans than their familiar role as a nuisance or annoyance on outdoor outings. Montana's stockmen, resort owners and developers lose money to mosquitoes each year. The part mosquitoes play in the transmission of disease poses a community health risk to us all.

From an economic viewpoint, livestock are particularly vulnerable. Mosquito attacks have been shown to cause a highly significant reduction in average daily weight gains in unprotected cattle herds. Studies in Louisiana reveal that exposed cattle bunch up and form compact groups on high barren ground where they neither feed nor drink for several days. These studies showed that the reduction in weight by Hereford steers would have cost ranchers an average of $4.20 a head in 1971 and $6.85 a head in 1972.

Cattle Harassed

In Montana, cattle have been observed running aimlessly when mosquitoes are harassing them, resulting in weight losses of a half pound a day or more. Calves in some areas of the state may lose more than 75 pounds during the summer, with greater losses in older cattle. Milk production may be reduced when mosquito densities near dairies are high. Anaplasmosis, a frequently fatal blood disease of cattle that is transmitted by mosquitoes, horse flies and ticks, costs U.S. stockmen $400 million annually. In rare cases, mosquitoes have caused weak and young animals to suffer or die from loss of blood or suffocate by inhaling large numbers of mosquitoes. The income stockmen lose to mosquito pests is as real as income losses to hail, insect crop damage and other natural phenomena.

The aggravation mosquitoes cause visitors to some Montana resorts has changed numerous vacationers' plans. A resort in northeastern Montana was beseiged with such a tremendous number of mosquitoes in 1974 that its golf course went practically unused from the end of June through August. These same mosquitoes encouraged 53 travel-trailer owners to leave the resort during one weekend. By summer's end the resort was near bankruptcy. When mosquito infestations occur, nearly all resort activities and businesses are affected — from eating at an outdoor restaurant to riding horseback

continued

on mountain trails. Obviously, people don't want to share their vacations with mosquitoes.

Real estate values in developments that have mosquito problems may be significantly lower than in comparable developments in mosquito-free areas. Homeowners won't pay for a patio, barbecue and backyard they can't use comfortably.

Threaten Health

Mosquitoes threaten Montanans' health. In Montana, two viral diseases, St. Louis encephalitis (SLE) and western equine encephalitis (WEE), are transmitted by mosquitoes. Virus activity varies geographically throughout the state. Within the complex of mosquitoes found in our state, one species, **Culex tarsalis,** is responsible for spreading both diseases, although others may be involved.

While both viruses are found in Montana, western equine encephalitis is more prevalent, afflicting four humans and 76 horses in 1975. Sera collected by the Department of Health and Environmental Sciences (DHES) between 1971 and 1973 as a part of health screening clinics, suggest many cases are not recorded. Symptoms may be mild and laboratory confirmation may not be obtained. A severe headache, brief fever and disorientation are characteristic of these infections. Permanent disorders stemming from SLE or WEE are rare except in infants. Affected infants may experience neurological damage and exhibit mental and motor disabilities that require institutionalization. Death results in a small percentage of cases. Mortality rates vary from 2 percent to 5 percent for western equine encephalitis.

Allergic reactions to mosquito bites are common. In severe cases, the eyes of victims swell shut, large lumps may appear on the neck and head and welts sometimes linger for weeks. Localized swelling and itching are typical. Scratching these areas to relieve the itching often causes abrasions and leads to secondary infections.

The extent of Montana's mosquito problem and the need to control the pests were recognized by early settlers. Meriwether Lewis and William Clark were perhaps the first to officially record our problem. While in Montana, entries in their journals contain more than 50 references to mosquitoes. Early trappers and homesteaders burned green wood in their fireplaces because smoke discouraged mosquitoes. To protect livestock, they burned moldy hay in a corner of a field so the stock could bathe in the smoke and escape their tormentors.

Habits the Same

Although times have changed, the habits of mosquitoes have not. Today, mosquito control is a major worldwide enterprise. In the United States, more than $55 million is spent in mosquito abatement each year. California alone expended over $13 million for mosquito control in 1974. The 20 mosquito control districts and 35 community abatement programs in Montana spent more than $400,000 last year. Most of these programs relied on synthetic chemical pesticide applications, exclusively.

When DDT and subsequent chemical pesticides were developed and extensively applied following World War II, the benefits to producers and public health authorities were immediately apparent. Pesticides were applied to agricultural crops almost universally. The food and fiber previously lost to insect pests and plant diseases were made available to feed and clothe millions throughout the world. DDT practically eliminated malaria, a debilitating disease transmitted by mosquitoes, from many countries. Technology appeared to have provided the ultimate weapon in man's long war against pestiferous insects.

Continued pesticide usage destroyed the illusion. Insects developed resistances to the chemicals used to control them. More pesticide was needed to provide the same level of control. Formerly innocuous insects were promoted to pests when broad-spectrum insecticides eliminated their natural enemies and removed the natural controls that previously existed. According to U.S. Department of Agriculture records, losses due to insect and plant diseases have increased since the 1942-51 period. For example, a 3.5 percent loss of corn from insects was reported for the period 1942-51 compared to a 12.0 percent loss for the period 1951-60. Public health statistics recount the same trend. In India, where the number of malaria victims was reduced from 100 million in 1952 to 60,000 in 1962, the toll has now risen again to six million. Today, 75 percent of India's health budget is spent to control malaria carrying mosquitoes. Repeatedly, the ultimate weapon has been used against us.

Documentation of insecticide resistance, "upset" pests (ones that formerly were innocuous) and public concern over the introduction of persistent chemical pesticides into the environment stimulated efforts to identify alternative pest management programs. Today informed pest control specialists have abandoned their narcotic reliance on chemical control methods and are practicing Integrated Pest Management (IPM). The integrated control concept deemphasizes the role of chemical insecticides and encourages more extensive use of cultural and biological controls.

Cultural Control

Cultural control involves altering the habitat in ways that discourage pest reproduction and survival. Biological control techniques simply encourage the natural predators, parasites or pathogens of a pest to control their populations at tolerable levels. Biological control is a part of the broader overall phenomenon of natural control. While natural control regulates pest populations within upper and lower limits over a period of time, it has no respect for human desires. On the other hand, applied biological control involves purposeful manipulation of natural systems to reduce pest numbers to acceptable levels. Both methods of pest control require a thorough understanding of the pest's life cycle and habits.

All mosquitoes need water that is slow or stagnant and shallow to complete their life cycle. They may breed in marshes, sloughs, irrigation ditches, fish ponds, borrow pits, tires or any container that holds water.

continued

All mosquitoes lay eggs. Some adult mosquitoes deposit their eggs singly or in clusters on the water surface. The eggs laid singly are deposited one by one on the surface or dropped on to it while the female is flying. Other mosquitoes lay their eggs below the surface and yet others deposit them in a suitable area near receding water lines where the eggs must wait for the water level to rise before they can hatch. Some mosquitoes may merely scatter their eggs over dry land in an area that will be submerged by spring run-off or irrigation activities. These eggs are extremely resistant to harsh environmental conditions. It is not unusual for viable eggs to withstand five years of recurrent freezing and drying. Despite this diversity in egg-laying behavior and site selection, all mosquito eggs need to be submerged to hatch into the larval stage, commonly known as "wigglers." When water temperature reaches about 50°F, hatching begins.

Larval Phase

The larval phase of a mosquito's development is the only period of growth in its life. Larvae pass through four instars or stages. They shed their protective skin (exoskeleton) before progressing to the succeeding instar and produce a new exoskeleton to accommodate their increased size. Water temperature is the most critical factor in determining the rate of larval development, although the species and amount of available nutrients may be influential. Under optimum conditions, larvae can pass through four instars and pupate within a few days.

Within the nonfeeding pupal state, the aquatic form of the mosquito is transformed into the flighty adult. This radical change in body form is accomplished over a period extending from one day to a few weeks.

Adult mosquitoes usually don't fly more than five miles from the water where they developed. Males normally linger near the hatching site and mate with the females soon after they emerge. Mosquitoes are most active at dawn and dusk, feeding primarily at night. A few species will attack during broad daylight, although most prefer to rest in shaded areas where they are protected from the drying sun.

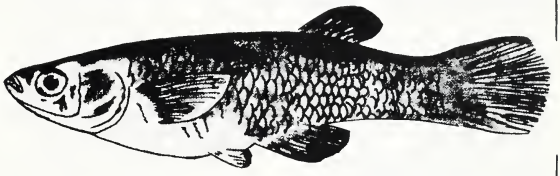
Only adult female mosquitoes take a blood meal. Males feed on plant juices. Different species of mosquitoes exhibit a variety of host preferences. Spring and early summer studies reveal that the common encephalitis mosquito, **Culex tarsalis,** bites humans readily, but prefers to feed on birds. Later in the summer, mammals, including man, furnish most of their blood meals. A member of the same genus, **Culex territans,** feeds exclusively on reptiles and amphibians. Females may feed four or five times during their lifetimes.

Natural mortality from predators, parasites and pathogens take a heavy toll on mosquitoes during the larval and pupal stages. Approximately 90 percent of the first instar larvae that emerge from mosquito eggs will not live to become adults. Thanks to these natural control agents, Montanans must endure only 10 percent of the potential mosquito numbers.

Since mosquito development requires water to remain undisturbed for at least seven days, many mosquito problems are really water management problems. Highway construction that does not provide adequate drainage, dam construction that floods peripheral areas and certain waterfowl management practices may contribute to local mosquito problems. The expansion in irrigation agriculture throughout the state has been accompanied by increased numbers of mosquitoes. Studies in the Milk River Valley of Montana have indicated that 90 percent of the mosquitoes in the area are produced in water associated with irrigation.

Mosquito Problems

Where mosquito problems are a consequence of human cultural practices, the ideal control strategy involves improved soil or water management rather than chemical or biological control. For example, in the Milk River Valley, the dominant clay soils absorb water rapidly when water is first applied. Following this, little or no additional water is absorbed. If more water is added, it will pond unless drained away or it evaporates. Fields with ponds of water from irrigation provide the basic ingredients for mosquito development if left standing for more than seven days.



Mosquitofish

Research by the Montana Agricultural Experiment Station suggests that good irrigation in the Milk River Valley requires large streams of water applied only long enough to fill soil cracks. This practice ensures that few, if any, mosquitoes can be produced as a direct result of irrigation, while good crops continue to be grown. A "flat" uneven topography, the existence of abandoned ditches and short-comings in the return flow cycle of many older irrigation systems continue to be obstacles in improving water management. Cultural control activities such as draining, diking, ditching or filling could be adopted in many areas with beneficial results.

When cultural control techniques cannot be used or where they are too costly, chemical or biological controls must be employed. The benefits derived from chemical control and the problems that have

continued

arisen from their wholesale use have already been enumerated.

If biological controls can be applied effectively and economically, they provide a safer and more environmentally compatible form of mosquito control. Typically, biological control agents attack only the targeted organism or pest. Biological controls do not leave persistent toxic residuals, are not incorporated into public food or water supplies and cannot be expected to have carcinogenic, teratogenic or mutagenic effects on the people who contact them. These characteristics make biological control more attractive than chemical alternatives.

Careful Evaluation

While biological control agents possess numerous desirable qualities, they must be evaluated carefully before they are used in large-scale control efforts. Biological control agents are reproductively active and can proliferate. Classically, they are not native to the region where they are introduced--they are exotics. Unfortunate introductions of exotics such as the grass carp, the English sparrow and European starling have emphasized the need for thoughtful investigations that outline the ecological soundness of introducing exotic species into the environment. Natural limiting factors must be identified to avoid culturing a new pest.

Montana's 44th Legislature recognized the potential significance of biological control and the fact that Montana was years behind other western states in evaluating its merits. The legislature appropriated funds to examine the potential of biological control and to integrate it into local mosquito control programs. Since that time, the DHES has been investigating the efficacy, environmental impact and economic feasibility of integrating biological control into local mosquito abatement programs. Through literature surveys and small scale field studies, the potentials of numerous predators, parasites and pathogens are being evaluated to identify biological control agents that will improve local mosquito control efforts.

Few animals have as many natural enemies as the mosquito. More than 200 pathogens and parasites affect mosquito larvae, and there are reportedly more than 500 predators that attack the larvae and adults. With such an array of enemies, the question of which natural enemies are the most practical, considering Montana's harsh climatic conditions, is not easily answered. Some, particularly certain larvivorous fishes, have proven their merits in mosquito control programs throughout more temperate areas of the world. Others seem completely ineffectual as practical biological control agents. Still others, including parasitic roundworms (nematodes) and **Toxorhynchites** mosquitoes, whose adults do not feed on blood and whose larvae prey on the larvae of mosquitoes that do, are strikingly effective in some field situations, but are unreliable and too expensive using current methods to raise and release.

Among the many organisms tried as biological control agents, the live-bearing, **Gambusia affinis**, or mosquitofish has been singularly successful. The mosquitofish has often been referred to as the universal larvivore and is the most widely distributed natural predator in the history of biological mosquito control. **Gambusia** have been used for mosquito control throughout the world.

The name **Gambusia** is derived from the Cuban word, gambusino, which means "nothing" in a scoffing sense. One is said to be fishing for gambusinos when he or she is catching nothing. **Gambusia** belong to the taxonomic family, Poeciliidae; the same family as the guppy. They are small topminnows. The females may reach 2½ inches in length, while the males rarely exceed 1½ inches. Mosquitofish are native to the southeastern and gulf coast United States.

Warm Water Ponds

Several years ago, **Gambusia** were introduced into several warm water ponds west of Drummond, Montana. They were probably released by a tropical fish enthusiast with no thought of culturing them for biological control. Mosquitofish have reproduced and the population has maintained itself without restocking in these ponds.

In 1976, the DHES transplanted some of these mosquitofish to a warm water settling pond south of Helena at Alhambra, Montana. They have flourished and provided a source of fish for biological mosquito control efforts throughout the state. To date, almost 200,000 **Gambusia** have been planted in water that breeds mosquitoes throughout Montana to evaluate their biological control potentials under field conditions.

The Broadwater County Mosquito Abatement District has used mosquitofish extensively in its control programs for the last three years and is delighted with the results. The board's secretary submitted this testimonial:

> Did the program work? we can't say for sure, if scientific data is your bag, BUT even though we had lots of larvae, it was difficult to find a pupae, and we assume the fish ate them. ALSO, there was not one complaint uttered to the County Commissioners, City Council, Mosquito Board, or the Mayor. The Board even received a complimentary letter!

Last summer, the department constructed an experimental plot in Broadwater County to scientifically evaluate the efficacy of mosquitofish. An acre pool that has historically produced mosquitoes was divided by ⅛" mesh netting to create two comparable bodies of water. On April 11, when the water temperature had reached 58°F, approximately 900 mosquitofish were released on one side of the netting; the other side was not treated to serve as a control. The original population of 900 **Gambusia** in the treated plot multiplied to several hundred thousand by August.

Gambusia were effective in controlling mosquitoes throughout the summer. Both temporary water (**Aedes** species) and permanent water (**Culiseta** species) mosquitoes were controlled. The levels of control in the treated area were comparable to the results that could have been expected using conventional chemical methods.

continued

The use of mosquitofish appears to be economically competitive with chemical applications. Some mosquito abatement managers in California claim they can control an acre of mosquito-producing water for less than a dollar using mosquitofish, while it generally costs $8 — $50 to control an acre with insecticides. El Paso County, Colorado, depends on mosquitofish for its entire control program and reports a 50-60 percent savings each year over insecticide cost. Unfortunately, no reliable application costs for **Gambusia** are available from Montana's mosquito control programs. However, our experiences have shown that planting mosquitofish once in the spring can eliminate two to four chemical applications throughout the summer.

Mosquitofish have adapted well to most mosquito-producing water within Montana and don't seem to influence the aquatic flora and fauna any more than native fishes. Collections made by the DHES suggest that aquatic insect diversity in water treated with **Gambusia** has not been reduced. Mosquitofish do not seem to displace Montana's game fishes. In fact, they may be important as forage for these game fish in the waters they cohabit. Fisheries managers in other states with coldwater fisheries have reported no harmful effects to the environment from the use of mosquitofish.

A physiological peculiarity of mosquitofish make them "controllable" within Montana. While Montana's aquatic flora and fauna have adopted life history strategies to overwinter in a harsh environment, **Gambusia** have not. Mosquitofish cannot survive in water that freezes over during the winter months, and their bodily functions, e.g., growth and reproduction, are severely retarded at low temperatures. The prevailing climatic conditions in the state act as a limiting factor on mosquitofish numbers and restrict their permanent establishment to warm water ponds and streams. **Gambusia** are not likely to become an undesirable exotic.

photograph by JIM LEITER

SEINING — *Author Van Jamison (front) and Ed Auker, district director of the Bighorn County Mosquito Control District, are pictured seining mosquitofish from the Alhambra pond late last May. The fish were transplanted in Bighorn County.*

Warm Water

Since mosquitofish overwinter in warm water exclusively, integrating **Gambusia** into local programs depends on locating suitable water near communities practicing mosquito control. Last year, the DHES established four local wintering sites to ensure the availability and timely application of this type of biological mosquito control. A high priority has been given to establishing new wintering sites to encourage greater utilization of mosquitofish.

Integrating mosquitofish into local mosquito abatement programs serves numerous public interests. The judicious use of **Gambusia** could reduce pesticide loads in sensitive areas such as swimming pools used by children and wetlands with high fish and wildlife values. Communities with limited financial resources can stretch their control dollar by employing biological controls extensively. Surveys performed by the DHES suggest that mosquitofish can be used effectively in approximately 30 percent of the mosquito producing water in some areas of the state. Mosquitofish deserve serious consideration in developing any mosquito control program.

Full Arsenal

Unfortunately, the practice of biologically controlling mosquitoes is essentially limited to the use of fish, despite intensified research and development efforts on diversified groups of parasites, predators and pathogens. Mass culturing techniques need to be perfected and large-scale field tests performed with numerous potential biological control agents.

If your community is practicing mosquito control and you feel biological control potentials have not been fully exploited, or if you would like to use biological controls to stimulate interest in mosquito control within your community, please contact:

Department of Health & Environmental Sciences
Bureau of Food & Consumer Safety
Vector Control Section
Helena, Montana 59601

Broadwater County's outline for developing a biological control program using mosquitofish testifies to their enthusiasm and should encourage you to try:

Want some fish? Find a warm water source, plant your fish, buy some food (we used 50 pounds last year), hope for the best, expect the worst, but praise the fish!

photograph by TOM ELLERHOFF

PRICKLY PEAR CREEK — *Healing something as fragile as a stream takes time and cooperation. Although the dredge tailings along Prickly Pear Creek are not as visible as they used to be, they still can be found. The picture on the opposite page shows natural restoration between Montana City and Clancy is working, but in many places vegetation on dredge piles (upper right) is scarce. Restoration in some parts of the drainage is even slower, such as up Spring Creek, where traces of iron—called "yellow boy"— can still be found (bottom). Rehabilitation is a continuing process, as shown in the circular picture (upper right). Mike Pasichnyk, Water Quality Bureau, takes a water sample near Mountain View School, in the Helena Valley.*

Prickly Pear Creek

Anthology of a Stream

by Kit Walther

Prickly Pear Valley and Prickly Pear Creek have their origins south of Helena. In the summer of 1862 "Gold Tom," one of the area's original prospectors, gave this little known valley an abrupt introduction to the mining world by finding gold nuggets in the gravels of Prickly Pear Creek near Montana City. Gold fever caught on quickly and soon several hundred miners were working

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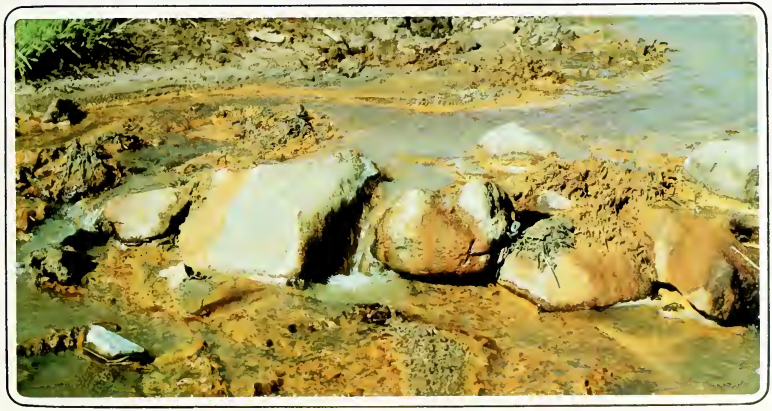


photograph by JIM BOND

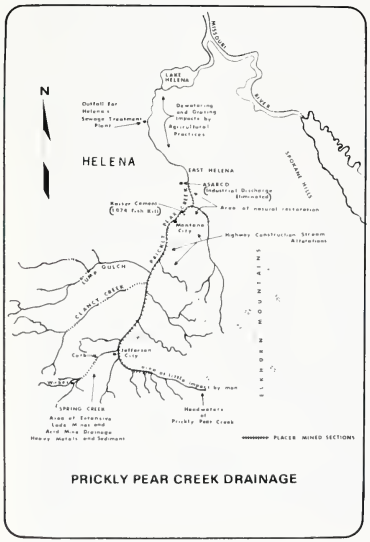
the placers. Later placer gold discoveries in Golconda Creek, Lump Gulch and others, and lode mine discoveries, like Mount Washington soon brought a great wave of miners to the valley. Prospectors swarmed over every hill and ravine in search of new placer and lode deposits.

Mining towns sprouted like mushrooms after a long spring rain. At their peak, towns with names like Clancy, Montana City, Lump City, Corbin and Wickes boasted populations of up to 1,500 people. Today little remains of the busy constellation of mining towns which suddenly appeared just after the Civil War, thrived brightly for several decades, then faded at the end of the nineteenth century. Most now are little clusters of aging buildings huddled near weedy spoil heaps and around ruins of old mines and mills.

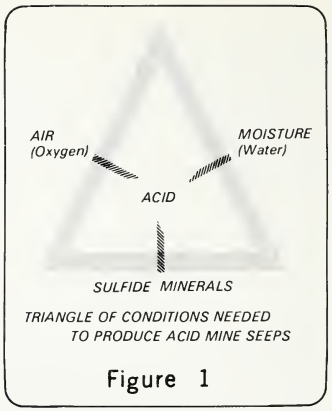
Just as 1862 began a new life for the immigrants who stumbled onto "Gold Tom" and stayed behind to work the elusive gravels of Prickly Pear Creek, so began the demise of the famous creek which once meandered peacefully through alders and willows to the Missouri River.

Subtle Killers: Acid and Metals

The high mountains surrounding Prickly Pear are mostly granite. Sulfide ores dug from the rich quartz veins yielded millions of dollars in gold, silver, lead, zinc and copper. The mined rock with no mineral value was dumped in piles at entrances of mine shafts, and waste materials from milling and smelting were haphazardly disposed of in the gulches and creek bottoms.



PRICKLY PEAR CREEK DRAINAGE



TRIANGLE OF CONDITIONS NEEDED TO PRODUCE ACID MINE SEEPS

Figure 1

Once exposed to the air and moisture, the sulfide minerals in the waste materials began to slowly decompose and produce sulfuric acid (Figure 1). Up Spring Creek, where the hub of early day mining was situated, there remain huge piles of worthless sulfide minerals, which have become the source of a nearly endless supply of acid. Acid water seeps from the walls of mine shafts, through the waste dumps and tailings piles and, finally, enters the drainages of Spring Creek above Jefferson City.

Heavy metals associated with the minerals (like copper, zinc, iron and lead) are readily dissolved in the acid seeps. Their concentrations in water are the highest where the seeps form, and become more dilute as they wash downstream. The most obvious metal of the seeps is iron. Its orange salts (called yellow boy) can be seen staining the shoreline rocks and stream bottom of Spring Creek. The most toxic metal in solution is zinc.

The acidic water and dissolved metals have a drastic effect on the biological life of upper Spring Creek. The creek is mostly sterile around the small mining town of Corbin. Further downstream the acid waters have no effect on Prickly Pear Creek because they are diluted by fresh water flowing into Spring Creek. The heavy metals on the other hand continue to have a profound effect downstream. Even at extremely low concentrations heavy metals harm aquatic organisms. Aquatic insect populations are reduced in Prickly Pear Creek for more than six miles below Spring Creek. Less desirable, pollution tolerant insects, such as dipterans (the flies) dominate the insect community below Spring Creek. Desirable insects, such as mayflies, stoneflies and caddis flies finally begin dominating the insect community 5½ miles below Spring Creek. Prickly Pear Creek above Spring Creek (where mining impacts are few), supports abundant and diverse populations of aquatic insects that are typical of cold water mountain

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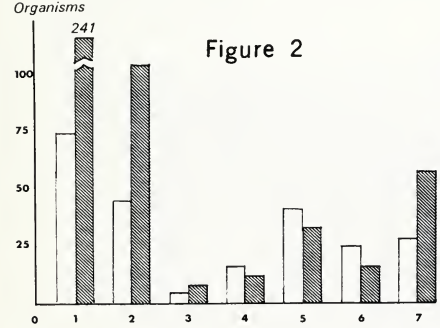
streams. Fish populations too, are greater above than they are immediately below Spring Creek.

Looking at the concentrations of dissolved metals helps explain the biological changes in Prickly Pear Creek. Above Spring Creek, metals concentrations in the creek are below the levels toxic to aquatic life (Figure 2). In contrast, in one upper tributary of Spring Creek and Spring Creek itself, metals range from 1,000 to 10,500 times the levels toxic to aquatic life. Below Spring Creek, concentrations of metals in Prickly Pear Creek decline because of downstream dilution. Still, even six miles below Spring Creek, metals remain much higher than the levels safe for aquatic life.

Mud and Fish Don't Mix

Too much sediment can be as detrimental to cold water stream life as heavy metals. Sediment covers and smothers aquatic habitat, insects and fish eggs. Spring Creek, the major source of toxic metals is also a major source of sediment in Prickly Pear Creek.

This graph compares the number of pollution sensitive and pollution tolerant organisms at several locations above and below the entrance of Spring Creek (data reported from THE EFFECT OF ACID POLLUTANTS UPON FISH HABITAT IN PRICKLY PEAR DRAINAGE, a report by Jim Traynor, 1969 for the Department of Fish and Game).



1 — 0.5 miles above mouth of Spring Creek
2 — Just above mouth of Spring Creek
3 — 0.2 miles below mouth of Spring Creek
4 — 0.7 miles below mouth of Spring Creek
5 — 3.5 miles below mouth of Spring Creek
6 — 4.5 miles below mouth of Spring Creek
7 — 5.5 miles below mouth of Spring Creek

Tolerant Organisms (midges and other fly larvae). Indicators of poor water quality.

Sensitive Organisms (Stoneflies, Mayflies and Caddis Flies). Important trout food and indicators of good water quality.

In the late 1800's, four crude smelters and several ore concentrators in the Spring Creek drainage processed ores from the surrounding hills. Remnants of old settling ponds and waste dumps still remain. High water from snow-melt runoff and intense rainstorms cut through the fine materials, carrying large amounts of sediment to Prickly Pear Creek.

In 1975, runoff generated by warm spring weather and heavy rains washed massive amounts of sediment into Prickly Pear Creek, cutting deeply through the tailings around Corbin. More than 90 percent of the sediment in Prickly Pear Creek below Jefferson City came from Spring Creek. Downstream the sediment raised havoc with farmlands, irrigation headgates and aquatic life.

Sediment Problems Not New

The "easy-to-get" placer deposits (gold bearing gravels) were largely played out by 1875. With the introduction of the big gold dredges in 1933, placer mining got its second boom. Drag lines and dredge boats worked the gravels from East Helena to Jefferson City up until 1948. Sporadic dredging occurred even as late as 1960. The big dredges permanently scarred Prickly Pear. The Yuba dredge boat (the last to work the creek channel) was capable of gouging out 6,000 cubic yards of gravel a day. As the dredge worked its way upstream, large steel buckets on a revolving chain scooped vegetation, topsoil, gravel and muck from the valley floodplain and stream channel. The dredged materials were dumped into a large sluice box in the boat and pumps provided running water to hydraulically separate the gold from the dredged material. From the rear of the dredge, muddy water was discharged directly to the creek and wasted gravel and clods of dirt were stacked in hugh spoil piles.

The new interstate highway along Prickly Pear leveled most of the gravel dredge piles, but in a few places they may still be seen supporting a few wisps of tough range grasses and pines. Years after placer mining ended, the dredge piles provided a chronic source of sediment. Severe channel alterations and vegetation destruction stripped much of Prickly Pear's natural trout habitat.

The creek has healed to some extent from its experiences with placer mining. Stream bank vegetation has come back in places, and the old dredge piles are no longer a big source of sediment. Deep dredge ponds which floated the Yuba dredge boat can still be seen in a couple of places, but for the most part the scars of placer mining are obscured by other impacts of more modern times.

A Mark of Progress and Change, Left by People in a Hurry...

Time and again Prickly Pear Creek has been altered for man's needs. Today most stretches of quality trout habitat are gone for good.

Placer mining, stream alterations for rail and highway construction, industrial development and flood protection of agricultural lands have changed more than 51 percent of Prickly Pear's 41-mile length. Important

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meanders (creek bends) have been eliminated, pools and riffles destroyed and bank vegetation removed. The stream is actually shorter, and in places the stream velocities are greater. Erosion is a problem in many of the channelized sections. Trout populations have never returned to normal where stream alterations drastically changed the original channel.

The Fish Kill of 1974

Acid waters are not conducive to aquatic life and neither is the opposite extreme. Strong alkaline waters can be dangerously toxic to fish.

When a warm January chinook in the Helena area produced a heavy snow melt, runoff water severely eroded the old Kaiser Cement industrial waste dump. Approximately 2,200 cubic feet of strong alkaline material was washed into Prickly Pear Creek. As the slug of material entered the creek it instantly raised the alkalinity to intolerable limits, killing some 4,000 fish for a distance of three miles downstream.

Fortunately, the damage was not irreversible and Prickly Pear Creek recovered.

Cleaning Up Pollution

ASARCO (American Smelting and Refining Company), is a custom lead smelter and zinc plant located along Prickly Pear at East Helena. It succeeded the largest ore reduction plant in Montana, which until 1893 was located at Wickes. For many years, fish kills below the ASARCO discharge occurred. Hot water loaded with heavy metals and sediment from the ASARCO discharge water (as high as 82° Fahrenheit (F)) raised instream temperatures by 5.7° F, compounding the toxic effects of the heavy metals.

ASARCO began a series of steps in 1972 which eventually eliminated their discharge from Prickly Pear Creek. A "no-discharge" treatment system was constructed that did away with the high temperature waste waters and an estimated 223 pounds of metals per day that entered Prickly Pear Creek.

Still More Degradation Downstream

Mining, industry and road construction have had the greatest impacts on Prickly Pear Creek above East Helena. Natural restoration and pollution abatement efforts have breathed new life back into some of the creek (particularly the area immediately above East Helena) where a few remnants remain of a healthy trout fishery.

But below East Helena, irrigation, grazing and the Helena Sewage Treatment Plant have persisting impacts which severely degrade the water quality. Heavy irrigation withdrawals in the summer leave the creek with little or no flow. Where there is flow in the summer months from returning irrigation water, the temperatures and nutrients in the stream are high. Heavy grazing in the lower stretches of the creek has also damaged bank vegetation and accelerated stream bank erosion. Here, aquatic insect numbers indicate substantial stress and trout are scarce.

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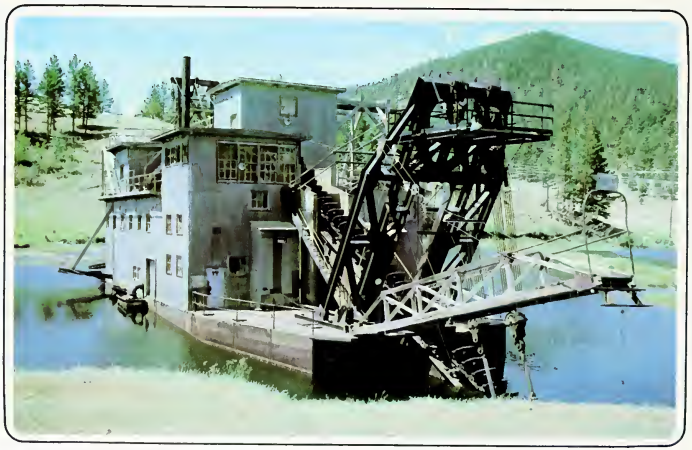

photograph by KIT WALTHER

THE YUBA—*The Yuba dredge once could gouge out 6,000 cubic yards of Prickly Pear stream gravel a day. For a number of years the Yuba sat in a dredge pool east of Interstate 15, just southeast of Jefferson City, a quiet reminder of another day. However, recently it was shipped to Brazil where it's again looking for gold.*

photograph by JIM BOND

DRY—*Dry years and heavy irrigation threaten the lower reaches of Prickly Pear Creek. In some instances there simply isn't enough water to go around, as pictured just north of East Helena several years ago.*

Compounding the agricultural effects is Helena's sewage treatment plant discharge. Although a tremendous improvement from years past, stream studies have shown the treatment plant still adversely impacts aquatic life and water quality. Changes in aquatic life above and below the sewage outfall indicate continuing organic pollution. Immediately below the sewage outfall, sewage bacteria **(Sphaerotilis)** and sludge-feeding fly larvae are present. Nearly a mile downstream from the outfall, the stream seems to recover and some clean water organisms are again present. But, the stream at this point is still moderately enriched by nutrients from the sewage treatment plant, irrigation returns and grazing. Closer to Lake Helena, heavy sediments and warmer water temperatures continue to create problems for trout and associated aquatic life.

The cumulative effects of irrigation, grazing and the Helena Sewage Treatment Plant discharge have made lower Prickly Pear Creek suitable only for industrial and agricultural water uses. Consequently the stream classification in the state's water quality standards is the lowest classification possible (an E-F). At one time, lower Prickly Pear was probably a prime trout stream. Today it ranks as one of the poorest quality streams surveyed in southwestern Montana by the Water Quality Bureau.

Yet There is Hope...

The degradation experienced in lower Prickly Pear does not have to be permanent. Unlike upper Prickly Pear, the problems are mostly reversible, even though the solutions are still complex.

An effort to bring back the fishery would require a greater public understanding of the interrelationships that exist between man and water, and the life it supports. Better irrigation management and stream conservation practices by adjacent landowners are needed to keep water in the stream. Preservation and restoration of stream side vegetation is needed to prevent the stream banks from eroding. And finally, the exact effect nutrients in the Helena sewage have on the creek and on downstream reaches, and the benefits derived from their removal needs to be accurately determined so citizens of Helena can decide how to reduce the effects of the sewage treatment plant on the creek.

Whether lower Prickly Pear Creek warrants this kind of attention is difficult to answer. Since most of the lower creek is bordered by private land, and public access is limited, citizens of the Helena area may find the effort unjustified. But, before the decision is made, we should keep in mind that landownerships are not static and public needs change. As these changes, occur, lower Prickly Pear Creek may one day become a valuable recreational resource for Helena area residents. Even today, this potential exists. At the mouth of Prickly Pear, along the western and southern shores of Lake Helena, is one of the finest natural areas in the Helena area. It supports one of the few great blue heron rookeries in the area and a diversity of waterfowl. With the fishery in lower Prickly Pear Creek restored, Helena area residents could have a recreational treasure.

Like many streams in Montana though, the future quality of Prickly Pear Creek is an uncertainty. If any thing is for sure, it is that its future rests in our hands, the people that made it what it is today.

photograph by TOM ELLERHOFF

Recycling Junk Vehicles Paying Off

by Bill Potts

That which is common to the greatest number has the least care bestowed upon it.
-Aristotle-

A common denominator in today's American society is the automobile. Probably nothing has more impact on our daily life than the mobility it gives us. However, the proliferation of the automobile has caused a serious dilemma, because almost all vehicles ultimately reach a point where they become a disposal problem.

Auto hulks are conspicuous and durable. Abandoned, they soon become eyesores detracting from the appearance of urban neighborhoods and rural landscapes. And yet, from another perspective, they are attractive because they contain materials which can be reused, thereby producing important environmental benefits.

In the early 1970s, the annual accumulation of junked and abandoned automobiles was causing serious problems throughout Montana. Private salvage yards traditionally gathered and recycled these junked vehicles, but they could not handle the massive numbers of abandoned automobiles. Additionally, the private sector was: a) not interested in an obsolete inventory that posed no real profit potential, and b) could not be expected to gather vehicles scattered throughout the countryside which often had no salvagable parts.

During this time, a national study, done by the federal government, indicated that many vehicles removed from license registration did not enter the scrap recycling cycle because they were being abandoned. They were being left on streets, discarded in fields or cast off along roadways. The study further showed that 24 percent of the abandonments were made by owners who did not know how to properly dispose of their vehicles. They found it easier to leave them where they could, rather than take the vehicles to scrap yards. The study pointed out that if a junk vehicle entered a scrap yard or some form of central collection, it usually entered a cycle of reuse, but getting the vehicles to these yards was the problem.

During the early '70s, it became apparent to many Montanans that a recycling system had to be established for discarded automobiles, and restrictions to this process minimized. It was determined that recycling had to revolve around a system that would bring the discarded vehicles to the processor, above and beyond what already existed. It also was recognized that the development of this system would require state and local government cooperation in conjunction with the efforts of the private sector.

Motor Vehicle Wrecking Facilities Act

In response to these environmental and resource conservation concerns, the Motor Vehicle Wrecking Facilities Act was passed by the 1973 Legislature. Through the provisions of this act, each county established a motor vehicle storage area or "graveyard," where any citizen could dispose of a junk vehicle free of charge. Also, each county was required to establish a collection program which would gather junk vehicles and place them in the graveyards. The graveyards had to be at least two acres and shielded from public view.

This act placed numerous administrative responsibilities on the state. Most importantly, it required the state to contract and supervise the firms that crushed and transported the vehicles to recycling centers. (The sale of junk vehicles to these crushing firms is accomplished through a bidding process, with the vehicles going to the highest bidder.)

Funding

The county programs are maintained and operated with funds returned to them from the state. According to the law, the annual payment to a county cannot exceed one dollar for each licensed motor vehicle under 8,001 pounds GVW (gross vehicle weight). However, for those counties with less than five thousand vehicles, the state may pay up to $5,000 annually for the county program.

The statewide program is funded by:

1 - assessment of an annual junk vehicle disposal fee on all vehicles under 8,000 pounds GVW;
2 - the sale of junk vehicles to recycling firms through private crushers, and
3 - wrecking facility license fees.

Each of the 180 wrecking facilities in Montana must obtain an annual license that costs $50. This fee is a minor revenue source for the program.

Revenue from the sale of junk vehicles fluctuates with the strength of the scrap metal market, transportation to available markets and the number of vehicles available. Estimated gross receipts from this revenue source are 10,000 vehicles per year at $10 a ton.

The junk vehicle assessment fee includes a 50¢ registration for a vehicle and a $1.50 fee for title transfers.

While the revenue gained from recycling junk vehicles is important, it is not enough to totally defray annual costs. As with many other types of recycling, some form of subsidization is required—in this case through the assessment fee.

The Statewide Program

As originally intended, each county retains a great deal of latitude in the type of program it operates. This enables county government to structure its program to fit local needs and desires.

Some method of vehicle retrieval has been established in every county. This service makes it possible for a person to release a vehicle to the county and have it removed to the graveyard free of charge. The types of retrieval programs vary from those owned and operated by the county, to county owned but operated by private contract, to cases where the entire retrieval operation is contracted to private individuals. The latter operation allows counties with small populations to provide adequate retrieval service on a part-time basis.

The types of retrieval vehicles used also vary, some local programs use flatbed trucks with winches, others employ flatbed trailers with winches and many use wreckers.

The abandoned automobiles are transported to the vehicle graveyards. These are generally situated near population centers. After 200 or more vehicles are collected, the state lets bids to private crushing firms for recycling the vehicles.

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The crushing firms use a variety of portable flatteners, but all serve the same purpose—to reduce the automobile body to a slab approximately 17 feet long and 7 to 10 inches high. The uniform slabs are stacked in semitruck trailers and transported in sufficient quantities to make further processing economical. The ability of these private operators to competitively purchase the accumulated vehicles is dependent on transportation rates, distances to markets and the current demand for steel. Scrap prices are directly related to the market demand for new steel and, therefore, fluctuate accordingly.

The flattened vehicles generally are transported to large auto shredders where a complete vehicle can be dropped into a shredder and torn into thousands of fist-sized chunks. High-grade ferrous scrap is then magnetically separated from nonferrous materials. From here the scrap enters the steel industry, most often going to rolling mills that utilize the scrap metal for such products as fence posts and concrete reinforcement bars.

As intended, the statewide junk vehicle program has not served in a competitive role to private salvage operations. In 1973 when the Motor Vehicle Wrecking Facilities Act was made into law, 124 private wrecking facilities existed, now there are 180. It costs an average of $25 a car to collect a junked vehicle, and since the value of each vehicle is approximately $10 a ton, there is an economic loss for each vehicle collected. This loss is subsidized by the junk vehicle assessment on motor vehicle licenses. In this respect there is no such thing as a "free" junk vehicle program, but the environmental and resource conservation benefits of the program far exceed individual costs.

Since the inception of the junk vehicle program, more than 44,700 vehicles have been collected, processed and recycled.

Benefits

Each year approximately 20,000 motor vehicles are removed from state licensing registration. Of this number, more than half are acquired by private salvage yards.

Since the inception of the junk vehicle program, more than 44,700 vehicles have been collected, processed and recycled.

Currently the program is gathering between 8,000 and 10,000 vehicles a year, greatly reducing the number of abandoned automobiles which once marred Montana's roadsides and landscape.

Energy Conservation

Energy resources are critical to our way of life, and the consumption of these resources is increasing at a spiraling rate. Nationally, industry consumes almost 30 percent of all available domestic energy, with the steel industry using 12 percent. After experiencing the trauma of the recent energy crisis, most people agree that energy conservation is vital to our future.

In this kind of serious setting, the use of iron scrap metal in steelmaking becomes important because it provides an energy savings of 74 percent. Put in other terms, each 1,000 net tons of steel manufactured from iron scrap conserves the energy equivalent of 140,000 gallons of gasoline. Since 1973, the Montana Junk Vehicle Program recycled nearly 55,900 tons of iron scrap. This tonnage represents an energy savings of more than 7.8 million gallons of gasoline. Montana's contribution to energy conservation would provide enough fuel for 20,000 automobiles to each travel nearly 5,900 miles (at 15 miles per gallon).

Since the program is continuous, its contribution to energy conservation is continual. Each year recycled cars contribute 10,000 to 12,500 tons of iron scrap to the steel industry. Such a volume provides an annual energy savings of between 1.4 million and 1.75 million gallons of gasoline. Again, enough fuel to power 20,000 vehicles more than 1,000 miles a year.

Between 5 and 10 percent of a junk vehicle is made up of copper, aluminum, lead and zinc. While not as impressive in terms of tonnage, the reuse of these materials also is important to energy conservation. For example, the use of aluminum scrap in manufacturing produces a 95 percent savings in energy. Equally, the use of recycled copper conserves almost 90 percent of the energy required when ore is used.

Resource Conservation

In conjunction with energy conservation, the use of iron scrap in making steel represents a 90 percent savings in the amount of ore needed for smelting and 97 percent less mining wastes. To date, the Junk Vehicle Program contribution to conserving the nation's iron ore deposits has amounted to 50,300 tons. The Montana program is supplying a significant alternative to mining domestic iron ore, a resource which is finite and rapidly becoming depleted.

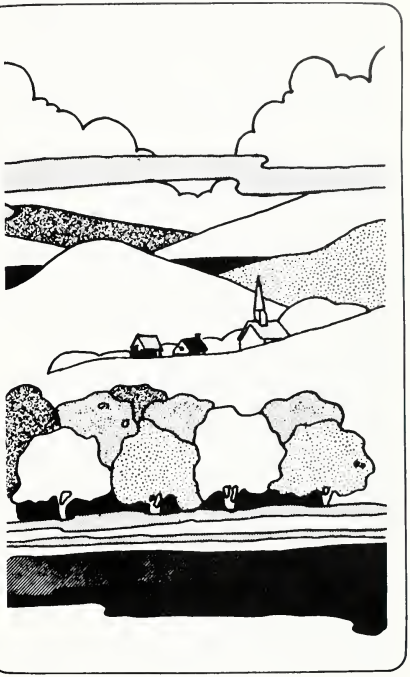
Environmental Quality

In addition to the reduction in mining wastes, the use of scrap metal from such sources as junk vehicles provides a significant reduction in air and water pollution. It is estimated that the reduction amounts to 76 percent less water pollution and 86 percent less air pollution. The Environmental Protection Agency (EPA) has concluded that pollution control costs can be reduced by as much as $4.16 per metric ton of steel when iron ore is replaced by iron scrap. These costs can be related directly to the price of steel. The use of scrap metal from such sources as Montana's junk vehicles is directly assisting in improving the quality of the nation's environment and indirectly reducing the cost of steel products to the consumer.

In addition to the benefits accrued through the recycling of abandoned cars, the Junk Vehicle Program has served all Montanans. The success of this program can be directly attributed to the willing cooperation between state government, private enterprise and all Montana counties.

Diary of a Homebuyer

Looking After You Leap



by S.C. Strom

(EDITOR'S NOTE: Many people are innocent about the complex ins and outs of buying a home. Although the characters, places and events in this article are fictitious, the situations faced by Mr. Robinson and his family are a composite of the author's professional experiences.)

Late last summer while having Saturday breakfast out, I ran into a long-time friend by the name of Ernest T. Robinson. Ernie and I hadn't met since we were in grad school several years earlier, and we lapsed into a lengthy conversation about the good old days. It turned out he was now doing wildlife articles for a popular conservation magazine, and when he learned I was now working with the Environmental Sciences Division, he ordered a second cup of coffee and unraveled a story for me which I found far too interesting to keep to myself. I have reiterated it here exactly as he told it. It is, of course, possible that Ernie may have taken some slight liberties with the facts, but then he is an author and is expected to use artistic license.

After three days of seemingly endless prairie roads, we had crossed Nebraska, South Dakota and eastern Montana without giving in to the strain of the sibling war being conducted in the back seat by our son Tim and our daughter Susan. Traveling through the mountains by car with two pre-pubescent gladiators and a nervous wife is an ordeal tantamount to cruel and unusual punishment. Perhaps the soothing effect of the imposing magnificence and serenity of these rugged mountains sustained our sanity. We were in awe. When we entered the seemingly peaceful Salish Valley, one of many charming and picturesque havens in western Montana, at mid-afternoon, a feeling of relief crept over Marge and me.

"I have to go to the bathroom," said Tim, age 5, lifting his head from his sister's head lock.

continued

"Me too," she shouted, regaining her hold and plunging toward the floor between the seats. Although Susan was but 8 years-of-age, she had clearly mastered the art of competing with the opposite sex. I heard Tim scream faintly from somewhere under the seat.

MARGE AND I were searching for a service station as we slowly wound our way into the heart of the Salish Valley.

"Maybe we should inquire about a place to live," Marge suggested.

"Plenty of time for that after a rest stop," I answered hopefully, and at that moment I spotted it.

"Wild Bill Morgan's Cafe" the sign read with two others hanging under it which mentioned "Real Estate" and "Self-Serve Gas." I pulled in and directed Susan and Tim to their respective destinations while Marge and I visited Wild Bill's real estate office. Wild Bill was almost predictable in appearance. He was seated at a roll-top desk smoking a cigar the size of Susan's forearm, shaded by a black western hat, the brim of which was folded in at the front like a paper airplane. He had on what folks call a "leisure suit" — a sort of Slim Pickens of the doubleknit set.

Living outside town is a big advantage to me, since I needed peace and quiet in order to concentrate on my writing. I had explained this and other housing preferences to Bill, as well as our plans to live in the area for only a couple of years until the series was complete.

"Know just the place," Bill said confidently, "tucked away in the woods. but not too far from town, by golly."

The kids returned, ready for more backseat hostilities and after several tries we had them loaded into Bill's car. Moments later we were zooming across the valley in Bill's El Dorado and listening to the condensed history of the area along with a sprinkling of current events.

MOST OF THE HOUSES we viewed were older homes and generally had 20 acres or more of land with them. Wild Bill's knowledge of the area seemed boundless as he related stories of the settlers and detailed histories of each of the houses we viewed. He was programmed for local color.

"Why is this called the Salish Valley?" asked Susan.

"Why are all these houses on 20-acre parcels?" asked Marge almost simultaneously.

We were just entering another driveway as Wild Bill loosened his wide-brimmed hat and adjusted his cigar as he prepared to answer.

"Because the Salish Indian Tribe used to live hereabouts," he answered.

Marge arranged her face in an expression of puzzlement. "The Salish Indians lived on 20-acre parcels?"

"No Mom," said Susan, showing modest irritation. "That's why they named it the Salish Valley."

"I have to go to the bathroom," shouted Tim as we entered the house.

It was a modest 3-bedroom affair, rustic in design and well cared-for. There was plenty of room and a small nook which looked just right for a place in which I could hide out and work on the series of articles I had to produce concerning the higher mammals of the Rocky Mountain area. Wild Bill didn't know it yet but we were nearly sold already. I began to wonder about the not-so-visible aspects of this warm little hideaway.

"How large is the lot?" I asked, gazing out the large dining room window across a gently sloping woodland.

"Twenty acres," replied Bill, "and, by golly it's a really nice forested tract with lots of privacy and all. You wouldn't even have to landscape or anything, all the trees are here already. You folks are certainly lucky that this place came along..."

"Why are there so many 20-acre parcels around here?" interrupted Marge doggedly. "It seems to be such a sprawling way to use land."

"Boy, what a neat bathroom," shouted Tim.

"Ooh, gross!" snipped Susan, assuming that 'bathroom' was an unsuitable word for mixed company.

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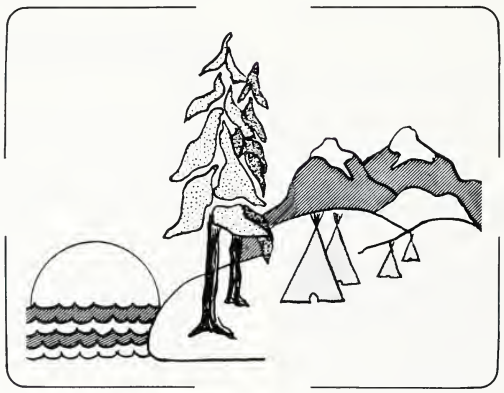

"But the toilet doesn't flush," continued Tim, undaunted. Susan's eyes rolled back in her head. Tim was a constant source of embarrassment to her.

THE REASON for the no-flush, I assumed, was that the power and water were undoubtedly turned off—but still I began to wonder again about such matters as sewage disposal, the well, and why there were so many 20-acre tracts around here.

"Lots of people like large tracts," volunteered Bill, apparently reading my thoughts. "Lots of privacy and quiet and all, by golly," he continued, with a down-home smile. "Not only that, you could always subdivide or sell the rest if you wanted a smaller lot, and probably make a tidy profit on the deal."

"I think I'd rather look at a house on a smaller lot," said Marge. I agreed.

The next place Wild Bill offered up was a small tract with a similar, but slightly more rustic, "ranch style" home in a subdivided area. On both sides of the clustered houses, the familiar strips of wheat farming operations carpeted the surrounding plain. Farther out the sheltering ridge of mountain peaks appeared to offer a bulwark against the outside world.

"Larchmont Haven is a really great little subdivision," Bill began, "you'd really enjoy living here, by golly. There's a community water system, nice size lots, full basement and here you don't have all those trees and brush to contend with. You get to landscape it in your own special way and plant just the kind of trees and shrubs that you want."

"That makes sense to me," said Marge, ignoring the fact that it takes several years for trees and shrubs to grow into "landscaping" and further ignoring that we would only be here for a year or two.

IN SUBSEQUENT CONVERSATIONS with Bill we learned that there was a community water system, a deep well, and that the house was well built, well insulated, with a huge furnace, and was close to schools. The school bus stop was just a half-mile down the road at the junction. We learned later that the half-mile driveway was a private road which was snowed in only part of the winter, and was not cleared by the county.

It seemed to be just about what we needed and everyone was in agreement, so after checking the financial arrangements and opening an account, we told Bill we would buy it.

"Well, by golly," chuckled Bill as he filled in the pertinent blanks in the buy-sell agreement, "we finally found the right place for you folks. Now we can get these formalities out of the way."

Neither Marge nor myself could qualify as knowledgeable in real estate, but we both knew that this agreement was far more than a formality. One particular paragraph went something like this:

"Purchaser enters into this agreement in full reliance upon his independent investigation and judgment and there are no verbal or other agreements which modify this agreement."

The "closing" was a bizarre ceremony which my wife and I attended armed only with a ballpoint pen and youthful optimism. Wild Bill was there with an attorney he introduced as his brother-in-law Myron A. Gillmun. Myron, unlike Bill, was a slightly built, balding man with a nodding demeanor who substituted head movements for words. He had a black plastic briefcase clutched in his left hand, into which he thrust signed copies as they were completed. The savings and loan officer was there explaining each document, and there were many, as we signed them. There was no seller present, but Myron Gillmun produced authority to sign for the owner corporation.

GILLMUN SIGNED, I signed, Marge signed and the process repeated over and over until we had signed everything but the tabletop. After a brief discussion concerning payments, interest and the mortgage insurance, which Gillmun had provided, it was explained that we (Marge and I) had to pay something known as closing costs. Gillmun closed his briefcase signaling completion. Both he and Wild Bill were smiling and shaking hands with everyone.

Gillmun signed, I signed, Marge signed and the process repeated over and over until we had signed everything but the tabletop.

"Well, Mr. Robinson, good luck with your new house," said Bill, lighting up a cigar and shaking my hand enthusiastically. "If there are any unforeseen problems, just you let me know, after all, I like to stand behind what I sell, by golly."

His frequent use of that term was beginning to unnerve me a little, but I was reassured by the fact that he apparently was willing to help if we had trouble. "Thank you," I answered.

About two weeks after we moved in I began work on the series of articles I was to write and after another week we began to discover some flaws in this slice of heaven we had so happily purchased from Wild Bill Morgan. I hold no ill will for Mr. Morgan personally, you understand, it just so happened that he was the person we chose, and he was chosen largely as a result of my son Tim's sudden toilet crisis. Tim had always taken delight in announcing his needs at inappropriate moments, partly because it embarrassed his sister, I suspected. His sense of timing was often amusing, but in this case it was disastrous.

At precisely 2:30 p.m. on Monday of the third week in our Larchmont Haven paradise, the water stopped flowing. Every faucet in the house, and the lawn sprinklers went on strike and refused to do anything but cough and groan. I spoke a few reassuring words to Marge and set out to find the cause of this calamity.

During the next two days I learned several interesting things about the water system and the subdivision in which we were living. The well and storage tank were at the north end of the development and we lived at the south end. As a result of this geography we had all the water we needed, so long as none of the neighbors were irrigating their lawns. They did not have prior water

continued

rights, but the water main went by the other lots long before it got to where our service connection was located. This, of course, was not a hopeless situation because there were several periods during the day when we had ample water, but these periods were mostly at night and early morning. (I knew I could never get Tim to adjust to this kind of schedule.) The water system, I discovered, was put in by the development company that planned the subdivision.

Upon contacting Wild Bill to see if he was willing to "stand behind what he sells" as he had told us, I learned another interesting fact about the system—it was all approved by the State Department of Health. Bill further informed me that it was only intended to supply domestic water and was not designed for irrigation and other uses which placed high demands on the pump and

pressure system. It turned out that he was quite right, as I learned later that week at the regional office of the State Health Department.

AFTER A LENGTHY CONVERSATION with the engineer who approved the plans for the water system, it was apparent that the system itself had not been approved, only the plans for the system.

"The system is not really subject to our regulations now," he explained, "because there are only 3 or 4 users. We approved the plans for the system as a part of the review of the actual subdivision lots."

"But I thought water systems had to be inspected and approved by the health department, or by the Water Quality Bureau or someone similar," I suggested desperately.

"Only if there are 10 users or more."

"Then who has control over the system?"

"No one does, except maybe the Larchmont Homeowners Association."

"If I own one of the lots then I must be a member, right?"

"I don't think so. You see, you are in the Larchmont area and on the Larchmont water system but not really in the subdivision."

"What?" I asked, beginning to turn white. "How can I not be in the subdivision?"

"Well, according to our maps, the lot you own is next to the subdivision but is not really a part of the plat. It is a separate parcel right next to the subdivision lots," he explained.

I didn't pursue this aspect any further as I felt myself turning purple and then gray. I breathed deeply and tried to regain composure.

"Okay, so after there gets to be ten users, then they will have to improve the system, in order to comply with the standards, is that right?" I asked hopefully.

"I don't think so. Water Quality Bureau will have review authority over the system then, but I think the system would meet the present standards."

"How can that be? There isn't enough water for irrigation and other uses right now."

"Our requirements don't include irrigation. For that matter, they don't include fire protection water either."

Fire. That was a threat I hadn't even considered yet. I felt myself turning purple again. Perspiration was cascading down my forehead. "Your standards don't require fire protection?" I screamed, losing my composure again. "What about that fire hydrant on the corner?"

"That's just a blow-off. Some sort of draining device is required on all dead-end water lines," he explained quickly.

I began to sink into a depression, and then it hit me. "I'll drill my own well, that's what I'll do," I said triumphantly.

"That would be fine," the engineer replied, "but first you should know, there are sanitary restrictions on your lot."

"What in blazes are they?" I asked without really wanting to know. I fought off a wave of despair.

"In a nutshell, that means it is illegal to build a house or put in water or sewer facilities on your lot."

I BEGAN TWITCHING uncontrollably. The engineer had discreetly buzzed for his assistants, two smiling young men who gently helped me to the door nodding and patting my shoulder. I struggled to stiffen my rubbery legs to the point where they would support my gelatinous body, and found my way to the street. The cool breeze in my face and a supportive parking meter kept me from slipping into apoplexy.

After a few minutes I was ready to go on. I phoned Marge in the hopes of extracting some strength and encouragement from her soft voice. She had always been a source of understanding and loyalty that could buck up my sagging confidence. There was a frantic tone in her voice when she answered, however, and I began to worry again.

"What's going on?" I asked, trying to sound calm.

"The toilets won't flush and the plumber said it's the septic system. The tank has backed up."

"Can he fix it?"

"You have to get a contractor to fix it. I already called one but he can't get to work on it until we get a septic tank permit from the county sanitarian," she said, with hysteria creeping into her voice.

"Calm down, it's nothing that can't be fixed easily, and certainly nothing to get upset about," I lied, resolving to be more candid with Marge in the future.

"Do you really think so?"

continued

"Yes," I answered, wishing I hadn't made such a hasty resolution.

"What do we do in the meantime? Tim has to go to the bathroom."

"Check into a motel," I suggested, "and leave me a note. I'll see you after I get the permit and make the arrangements."

She seemed to be calming down some, but I wasn't. I headed directly for the county sanitarian's office. I had gathered enough self-assurance and aplomb to reopen the subject of sanitary restrictions. Surely I would not be prevented from repairing a system that was already there. After all, I wasn't the one who built the house and sewer system in violation of the restrictions. Any fool could see that. What good would it do to keep me from remodeling the system. Even if I couldn't drill a well, surely I would be issued a permit to fix the sewer.

"We can give you a permit to repair the sewer," the sanitarian explained, "but you probably better apply for approval of the lot first."

"Explain," I said simply, my voice in a cracking falsetto.

"Well, this lot may not meet the subdivision standards," he began, "and if it does not meet the standards, then the sanitary restriction will stay on the lot, and since there is a house and sewer on the lot, a violation of the law exists. That could mean that your ownership is in question. You might lose your investment."

"How so?" I asked, struggling to remain rational.

"According to the law, you cannot sell a lot with sanitary restrictions on it, and all sales or transactions which violate the law are void. Likewise, instruments which convey lots contrary to the law are void. In other words, you may not even own the lot and certainly could not sell it, legally."

"Go on," I said with tearful eyes.

"What it boils down to is this—you must apply to have the sanitary restrictions removed. If you cannot, it may not be worth the expense of repairing the sewer."

Fire. That was a threat I hadn't even considered yet. I felt myself turning purple again. Perspiration was cascading down my forehead.

I COULD HEAR distinct popping sounds that seemed to be coming from inside my head. My hands gripped the arms of the chair with white-knuckle pressure. I struggled desparately to come up with some alternatives to violence.

"If sales of lots with sanitary restrictions on them are not completely legal, then I should be able to get my money back and return the property to the seller, right?" I quizzed, fighting off waves of hopelessness.

"You may be right," he conceded, "but you'd have to talk to the title insurance man or an attorney to find out about that."

"I certainly will, but there is still something that's not clear to me."

"What's that?"

"Who attaches the sanitary restrictions to a lot?" I asked.

"The county clerk does."

"What does the county clerk know about sanitation?"

"Nothing," he answered, "but the clerk knows when a new parcel of ground is being split off, and that makes it a subdivision of land. All subdivisions are subject to a sanitary restriction unless the developer has them approved first."

"You mean like Larchmont Haven."

"Exactly," he said. "That one was approved before the plat was filed, but the lot you own was filed without being approved first and that's why it has sanitary restrictions."

"So all lots have to be approved by the Health Department."

"All except those over 20 acres. That's why there are so many 20-acre tracts around," he explained.

The title insurance policy, it turned out, also had some intricacies of which I was not aware. Certain things are excepted.

"This policy," my agent explained, "doesn't guarantee that the property is everything you thought it was."

"Well then what does it guarantee?" I screeched.

"It guarantees that the title to your property is in order and is the proper title for the particular piece of property that you purchased."

"If it's in order, what about the sanitary restrictions?" I yelled, frantically.

"That's an exception."

"What about the buy-sell agreement?" Now I was grasping at straws.

"They usually have a standard disclaimer stating that no other agreements can modify the buy-sell agreement, and that purchaser is in full reliance on his independent investigation."

I HAD READ this particular document carefully and I knew he was right. Not wishing to weep openly in a public place, I quickly reeled out the door to throw myself at Wild Bill's mercy and try to get my money back. Within a week I had convinced Wild Bill to refund all my money except, of course, the commission and a few incidentals such as taxes and legal fees. Myron A. Gillmun took care of everything for us and saved me the expense of hiring my own attorney. It all seemed like a minor expense compared to the losses and possible losses we had been facing.

"I've never been so relieved in my life," breathed Marge as we drove across the valley toward our newly rented apartment. We relaxed and admired the peaceful landscape during the half-hour drive and discussed the unfortunate events of the preceding weeks.

"You should see our new apartment," said Susan enthusiastically, "it's really cool."

"I hope you don't mean the heating system is bad," I said.

"You're weird, Dad," she replied disdainfully.

"By the way," Marge said, "Did you ever find out why there are so many 20-acre lots around here?"

"Yes, and someday I'll tell you about it."

"I have to go to the bathroom," said Tim.

Want to Get Involved?

Here's How

by Eleanor A. Parker

Private citizens desiring to influence a decision made or about to be made by the Department or the Board of Health and Environmental Sciences—or any other state agency—often find themselves confused by the procedure they legally must follow. Most of an agency's major decisions involve either making rules to implement legislation or taking action on licenses, permits or otherwise making a determination affecting someone's rights. The Montana Administrative Procedure Act (APA) dictates the rules of the game when any of the above situations occur. If you are interested in participating, the following are important points to remember:

RULES

Rules are **important.** Administrative rules are adopted by agencies to provide the kind of detail necessary to administer a law. They can be as important as the legislation itself; for instance, the maximum levels of air pollutants to be allowed in Montana are set by rule, not by the Clean Air Act.

The APA requires the public to be informed **before** a rule is adopted, to give it time to comment and propose changes. Proposed rules are published twice monthly in the Montana Administrative Register, copies of which are in the hands of every clerk of court and county clerk and recorder, to name the two most accessible sources. However, if you want to be sure you know about departmental or board proposed rules, it is best to notify the Department of Health director's office (449-2544) and have your name put on the mailing list. (Note: the department administers several different laws; each gives rule-making authority for that law either to the department or the board.)

You do not need a lawyer. Comments on proposed rules may be submitted orally or in writing. If a public hearing is held, your testimony will likely be given under oath, and you may be questioned by agency members, but everything you say that is relevant to the rule will be considered. Rules of evidence and procedural rules utilized in court actions are not needed or used in a rule hearing, eliminating the need for a lawyer.

You have the right to request a public hearing if the rule in question does more than set up procedure, such as the previously mentioned air quality standards. More particularly, a public hearing *must* be held if requested by 10 percent or 25 of the people who will be "directly affected" by the rule, by a government subdivision or agency or by an association of at least 25 people who will be directly affected.

You may initiate action to get a rule changed **after** it is in effect or to adopt a new rule. The procedure is to file a written petition with the agency responsible for rule-making for the law you are interested in (either the department or the board), stating what changes or additions to rules you want. The form the petition must take is also prescribed by rule and would be most easily obtained by contacting the department.

CONTESTED CASES

Contested cases are proceedings before either the department or the board to determine the "legal rights, duties or privileges" of an individual or organization, as, for example, a hearing before the board to appeal a decision by the department to order an industry to install pollution control equipment by specified dates.

A hearing appealing a decision to deny, suspend or revoke a license is also a "contested case." Whenever a contested case proceeding is held, it will be very much like a proceeding in district court. If you are involved in such a proceeding, expect the following:

You may need a lawyer. Unlike rules hearings, formal rules of evidence apply to contested cases, meaning that testimony is strictly monitored in order to prevent the decision-makers from hearing any that may be irrelevant, prejudicial or unreliable. If you do not have a lawyer you may not be able to recognize or object to evidence that should not be admitted and could hurt your case. As a matter of practice, hearing officers tend to bend over backwards to help people who appear without attorneys, but don't depend on it.

The APA requires the public to be informed before a rule is adopted, to give it time to comment and propose changes.

When you testify, it will be under oath and subject to cross-examination.

Do **not** talk to the decision-makers by yourself. No board member, department representative or hearing officer involved in making the final decision is allowed to discuss the issues in a case with one party without all the other parties having a chance to participate. If you do it, the person you talk to may be disqualified for prejudice, or any decision he or she participates in may be invalidated.

Testimony is to be limited to those who are parties to a case, which are normally persons directly and substantially affected by the proposed action. However, the APA allows a hearing officer considerable discretion in allowing persons to be made parties for "limited purposes," which, whatever that means, appears to give the public a broader opportunity to participate in contested cases than would be available in district court. If you wish to participate in a contested case hearing, contact the hearing officer ahead of time so he or she can decide whether to admit you as a party.

If the final decision goes against you, you may appeal to district court by filing a petition with it within 30 days after you receive formal notice of the final decision. Your right to appeal is lost if you do not file within that time period.

Final note—unfortunately, there is more to administrative procedure than is outlined above. If you have any questions, please contact the department for help. You have a legal right to participate in significant decisions made by the department or the board, so make the best of it.

etc.

emergency response

Many substances harnessed by science have dual natures. On one hand they serve man, on the other they are hazardous.

For a number of years the Department of Health and Environmental Sciences responded to hazardous material accidents as they occurred, but as shipping increased, so did the potential for mishaps, thus the department created an Emergency Response Team. The team is composed of trained individuals capable of responding to hazardous material emergencies.

In an emergency, the team will advise and assist in efforts to protect the health of the public and the crews dispatched to contain, recover and clean up hazardous materials accidents.

The Emergency Response Team will respond to incidents involving loss or potential loss of toxicants, irritants and asphyxiants, but in instances involving flammable substances or explosives, notification will be referred to the State Fire Marshal's office. Occasions may occur when health team members will respond in conjunction with people from the Fire Marshal's office.

The Disaster and Emergency Services Division, Department of Military Affairs, coordinates local, state and federal involvement in hazardous material emergencies. The division maintains a 24-hour telephone number (**449-3034**) so accidents can be reported day or night.

air treaty

Former Sen. Paul Hatfield (D-Mont.) helped pave the way last fall for the U.S. Secretary of State to negotiate an air pollution treaty with Canada.

The Hatfield Treaty Amendment was prompted by the development of a coal-fired steam generating power plant complex on the Poplar River, north of the Montana-Canadian border in Saskatchewan.

The proposal, signed by President Carter, was designed to act as a vehicle for resolving mutual air quality problems. Prior to its passage there was a means for dealing with water quality issues (the Boundary Waters Treaty of 1909), but no basis for solving air quality problems.

The former senator's amendment directs the secretary of state to make every effort to negotiate a cooperative agreement that will preserve our mutual airshed and—working in cooperation with federal and state agencies—take whatever diplomatic actions necessary to reduce or eliminate any undesirable impact from any source of air pollution.

"I feel a special sense of responsibility in that my state of Montana borders on three Canadian provinces—the only state to do so," Hatfield said in his introductory speech. "Our mutual border residents are good friends and neighbors. What affects the environment of one affects all."

returning tax dollars

If you think all your federal and state tax dollars are flying away from your community, they're not! Some of those dollars, like homing pigeons, make a wide sweep through state and federal coffers and end up financing local government projects.

For example, you might consider the $1,154,943 the bureaus in the Environmental Sciences Division channeled back to local governments in Fiscal Year (FY) 1978. This meant that more than a quarter of the division's budget went directly to city and county governments.

continued

A closer look at the money dispatched to local governments reveals the Food & Consumer Safety Bureau returned $117,792; Solid Waste Management Bureau, $749,197; Air Quality Bureau, $88,686; Water Quality Bureau, $164,268, and Subdivision Bureau, $35,000.

Last fiscal year the Food & Consumer Safety Bureau sent $116,537 to Montana counties to help pay for the inspections of restaurants, motels and hotels. The money came from license fees for hotels, motels and restaurants. Additionally, the bureau sent $1,255 to local officials for the inspection of homes for developmentally disabled persons.

A total of $614,458 from vehicle licensing, recycled junk vehicles and wrecking facility license fees was channeled back to counties on a formula basis last year by the Solid Waste Management Bureau to help run local junk vehicle programs. The bureau also funneled $134,739 to local governments for use in resource recovery planning.

Just about everything costs something these days, and fresh air is no exception. The Air Quality Bureau returned $900 to counties from money gathered in enforcement actions. Additionally, the bureau sent $87,786 in state and federal funds to local governments for air pollution control programs.

Like clean air, clean water has a price tag. The Water Quality Bureau, acting in an administrative capacity for the Environmental Protection Agency, sent $49,060 to counties for sediment control programs; $87,208 went to Areawide 208 water quality improvement programs, and returned $28,000 to local governments to help run safe drinking water programs.

The Subdivision Bureau sent about $35,000 to counties that reviewed local subdivisions.

setting up shop

A branch office of the Environmental Protection Agency (EPA) set up shop in Montana last fall and brought something special with it—authority.

Although the EPA has other field offices, the Helena-based Montana Operations Office (called — you guessed it — MOO) is the only office that has the authority to make many of the decisions formerly made in the EPA's Region VIII headquarters in Denver. According to Ivan Dodson, director of the Montana office, the quick, person-to-person access to EPA personnel will save time, money and shred government red tape.

"There are a number of advantages to being able to sit down and discuss problems in detail," he said. "Not only are you able to explain your side more clearly, but you are able to better understand the other side, which in many cases produces other ways of solving problems."

Certainly veteran government employees, industrial representatives and others who deal regularly with EPA will not miss the long, costly treks to the six-state* regional office in Denver.

Dodson noted that the Montana office will continue to work closely with counterparts in state government and hopes to form good working relations with city and county governments.

"After all, across the board, we're all equal partners in getting the job of pollution control done," he said.

In light of the many EPA improvement grants issued to Montana local governments, the massive resource development in eastern Montana and the effort needed to keep up with air and water pollution control, MOO will have plenty of work to do.

In order to meet its varied workload, the office is divided into two sections: the water section and air, pesticides, waste management and toxic substance section. Additionally, there are an energy coordinator, public affairs coordinator, administrative staff and Director Dodson.

The water section is further broken down into the water quality management area, which includes planning activities; construction grants, programs for improving local wastewater treatment plants, and environmental impact analysis, such as the work being done on the Flathead River Basin Environmental Study.

The air, pesticides, waste management and toxic substance section includes persons working on the State Implementation Plan for air quality; legal compliance activities; working with the Montana Department of Agriculture on pesticide certification and regulations, and helping state and local officials to solve waste management problems.

Establishing a new office is not all glamour, it also includes such down-to-earth matters as finding office space, matching chairs with desks, waiting for file cabinets, hoping you have more than one electrical outlet, etc. Dodson said although there are a few details that need to be ironed out, MOO is fully operational. Its offices are in the new Federal Building at the south end of Last Chance Gulch.

Persons or agencies interested in contacting Dodson and his staff should call 449-5432 or write: Environmental Protection Agency, 301 S. Park Avenue, FOB Drawer 10096, Helena, Montana 59601.

*Montana, North Dakota, South Dakota, Wyoming, Utah and Colorado

improving wastewater treatment

The wastewater treatment construction grants program in Montana is administered by the Water Quality Bureau in cooperation with the Environmental Protection Agency (EPA). The program began in 1956 to help municipalities meet the treatment requirements established by the state and EPA.

The program provides money for the planning and construction of new or upgraded wastewater treatment facilities and some of the associated sewers. A state priority list is used by the Water Quality Bureau to disburse the funds on a priority basis to public entities needing better treatment systems.

Throughout the years federal grant funds have assisted more than a hundred Montana communities in meeting improved wastewater treatment requirements. By fiscal year 1980, it is expected that around $166 million in federal and local funds will have been spent for wastewater

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treatment facilities in Montana. Nearly $87 million have been spent to date. The federal grant share has varied over the years. Currently that share is 75 percent, with the municipalities picking up the remaining costs.

There are 85 projects in progress in Montana, but many of these are in the planning stages. Actual construction is under way (or will be under way shortly) in 34 Montana cities. Examples of what a few towns are doing to improve their treatment systems include:

--Hardin, Miles City, Stevensville and Forsyth are all in the process of constructing "oxidation ditches" to treat their sewage. Presently these towns use sewage lagoons for treatment. Oxidation ditches are new to Montana. The towns of Poplar and Colstrip were the first to have this type of treatment system in the state. The oxidation ditch is an oval-shaped ditch in which wastewater circulates and aerates. The wastewater is biologically stabilized in the ditch and then passes on for settling and then is discharged. The primary advantages of the oxidation ditch over the sewage lagoon system are it can treat more sewage in a smaller area and provide better treatment, when properly operated and maintained.

--The town of Livingston will soon be upgrading its primary treatment plant to secondary treatment. Livingston plans to employ "rotary biological discs" to improve treatment of its wastewaters. This system uses a series of closely spaced discs (10-12 feet in diameter) mounted on a horizontal shaft. The discs are rotated, leaving about half the discs' surface area immersed in the wastewater. Growths of protozoans and bacteria on the discs break down the organic wastes in the sewage, providing secondary treatment. A pilot plant at Livingston has been constructed and is being used to develop the necessary design criteria for a full-scale plant.

--Butte and Silver Bow County are in the process of completing the sludge-handling portion of their sewage treatment plant. Sludge from the plant will be transported through a seven-mile pipeline to a holding pond. From there the sludge will be disposed of on rangeland by soil injection.

--Eureka will be changing over to an aerated lagoon (essentially a pond of wastewater with air blown in through pipes). The discharge from the lagoon will be used to irrigate nearby land. Thompson Falls and Whitefish both plan to upgrade their lagoons by adding aerators and separate cells.

More information can be obtained about what Montana towns are doing to improve their wastewater treatment facilities by contacting the Water Quality Bureau, or your city officials.

planning grants

As the result of legislation passed by the 1976 Legislature, the Department of Health and Environmental Sciences (DHES) has been awarding solid waste planning grants to local governments for the past year and a half.

To date more than $186,000 has been granted to 47 counties and municipalities to develop comprehensive, site-specific solid waste management plans.

The planning effort includes a detailed study of waste generation, existing conditions and viable alternatives to present methods of operation. This undertaking is a vital step in improving solid waste management services throughout the state. The ultimate benefits to local governments include closing open burning dumps, and more economical service at a reasonable cost.

best darn hamburgers

Hamburger is widely used and vastly popular. It is relatively inexpensive, convenient to prepare and liked by people of all ages.

Because hamburger is so widely used and because it is a perishable, it can be abused. Over the years regulations have been developed and used to protect hamburger and make it a better product.

Hamburger is ground fresh beef, with or without the addition of suet and in some cases, seasoning. The total fat content is not to exceed 20 percent and no fat other than suet can be used. This official definition of hamburger doesn't permit the use of preservatives or extenders.

Samples of hamburger are collected by the local health department sanitarians randomly throughout the state to determine the compliance by the retail stores to the standards for hamburger.

The 20 percent maximum fat limit is determined by sending samples to the Department of Health and Environmental Sciences (DHES) Chemical Laboratory in Helena for analysis. The laboratory also checks the hamburger for added water, preservatives and extenders.

The DHES Microbiology Laboratory, also in Helena, analyzes samples for bacterial content. These results help sanitarians in their inspections of the retail stores, particularly with respect to maintaining better sanitation, quality and longer shelf life.

Ground beef, hamburger or burger are all the same product and must comply with the aforementioned definition.

When extenders such as soy flour are added to the ground meat, then it must be labeled by some other name, such as beef patty mix. The label must also list the ingredients in descending order of predominance.

If you ever have questions concerning hamburger standards, you should contact your county health department sanitarian, or the Food and Consumer Safety Bureau in Helena.

Big Hole film

The chief source of water for most Montana streams is the snow that accumulates in the high country. As it melts, it recharges the streams, but by late summer—unless augmented by rain or water storage—stream flows are low.

Some years the amount of water taken for irrigation and other uses exceeds normal low flows, leaving streams temporarily dry.

In an effort to portray the needs of both fishermen and irrigators, and to serve as a point of departure for discussion, the Water Quality Bureau sponsored a documentary film of the

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Big Hole River, called "Man and Water."

In addition to examining water quality aspects, the film outlines farming, ranching and irrigation practices in the Big Hole Basin. The film also traces some of the area's history beginning with Meriwether Lewis' description of the Big Hole in 1805 as ". . . bold, rapid, and clear." Depicting the dependence of man and fish on the river, the documentary acknowledges that change on the Big Hole is inevitable, but suggests that it should bear the mark of man's intelligence and creativity rather than the selfishness and carelessness that have ruined other streams.

Although the film focuses on the Big Hole, its message is applicable throughout the state. Groups interested in viewing the film and discussing dewatering problems should write or call:
Department of Health and Environmental Sciences, Attn: Water Quality Bureau, Capitol Station, Helena, Montana 59601 or telephone: 449-2406.

clean air victory

If you can't detect any difference in Montana's clean air, it's because the state Supreme Court declared last September that the open-burning rule and Montana Clean Air Act were both valid.

The high court ruling backed a district court order prohibiting the Lincoln County Commission from violating the open-burning permit requirements of the state Department of Health and Environmental Sciences (DHES).

The 1967 Clean Air Act gave the state Board of Health authority to adopt the rule prohibiting open-burning, including the burning of leaves and yard trimmings, without a permit, the Supreme Court said.

In 1974-75, the DHES agreed with Flathead and Lake counties to conduct an experimental program allowing open-burning without a permit. The no-holds-barred burning created more problems than it solved and was subsequently shelved.

Lincoln County declined to participate in the experiment. However, in 1977 the Lincoln County commissioners decided to allow the burning of yard and wood wastes without a permit from March 12 to April 18. On March 22, the DHES filed suit in district court to stop the burning.

In its decision, the high court said the county did not have the authority to ". . . nullify a board rule by adopting a more lenient rule." It also said the Clean Air Act did not violate constitutional requirements concerning legislative delegation of powers to the board.

water spots

The Water Quality Bureau has produced a series of 10 public service announcements for 11 Montana television stations. The spot announcements deal with water quality problems that occur from various land use practices and ways to solve the problems. All the spots were produced in Montana and reflect water quality problems unique to the state. If you wish to talk about any of the announcements write or call the Water Quality Bureau in Helena.

air study

A five-year study of the air quality in the Flathead River Basin hopes to provide valuable information to persons and organizations making future development decisions in the Flathead Valley.

The study is being done by the Air Quality Bureau and is one of five studies assessing environmental conditions in the area. The entire project is funded by the Environmental Protection Agency.

The air quality portion is aimed at accomplishing the following objectives:

1) To gather basic information which will indicate air quality, visibility and meteorology in the Flathead Valley;
2) gain an understanding of air quality trends in the valley;
3) develop the capability to analyze and ascertain air quality impacts of future developments by using information obtained in the study, and
4) improve methods for maintaining air quality.

The scope of the study includes the lower Flathead Lake area, the Kalispell and Columbia Falls areas and the North Fork of the Flathead River region.

authors' corner

The variety of stories in this issue of Montana Environmental Sciences is a small sample of the many projects the people in the Environmental Sciences Division were involved in last year.

Ben Wake's commentary about future choices is particularly timely in light of the many environmental health decisions facing Montanans today. As administrator of the division, Ben is particularly aware of the complexities of these choices.

Daryl Mercer is not only the author, he's also the detective in *Searching For Clues to Butte's Radiation Puzzle.* Daryl worked for the Occupational Health Bureau for a year before taking a job in New Mexico in 1974, but returned last year.

Jerry Schneider makes his second appearance in Montana Environmental Sciences. Jerry manages to work his writing assignments into a busy schedule of analyzing air quality statistics.

Controlling pesky mosquitoes is no small task, as we learned from Van Jamison's article. Jamison has a master's degree in zoology from the University of Montana and works in the Food and Consumer Safety Bureau.

The story of Prickly Pear Creek is not unlike the stories of many creeks throughout the state. Author/photographer Kit Walther works for the Water Quality Bureau, and in addition to his writing and photography talents, Kit also does a great deal of radio and television work.

Recycling junk vehicles is paying off in Montana. This is Bill Potts' second article for Montana Environmental Sciences. An accomplished writer and photographer, Bill works for the Solid Waste Management Bureau.

Nobody knows better than S. C. "Stan" Strom that buying a home is no easy proposition. A member of the Subdivision Bureau, Stan has a master's degree in public health (environmental sciences) from the University of California, Berkeley.

Public involvement is an important ingredient in successful government. The author of our story about getting involved in the government decision-making process, Eleanor Parker, is an attorney for the department.

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COLOR WORLD OF MONTANA, INC
201 E. Mendenhall Bozeman, MT 59715